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JOURNALS

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GNT Road, Madavaram, Chennai – 600 110

(Affiliated to the University of Madras)

International Journal of Current Research and Academic Review

SAASC-NCST-23

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VOL - II, SUPPLEMENT -2 **ISSN NO - 2347 - 3215**

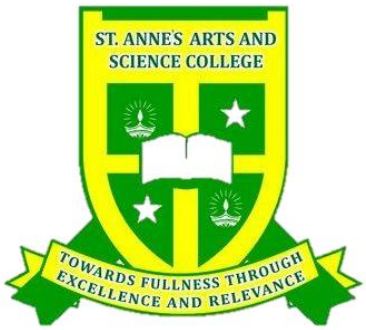
OCTOBER 2023

NATIONAL CONFERENCE ON RECENT TRENDS IN SCIENCE AND TECHNOLOGY

SAASC-NCST-23

on

07.10.2023



International Journal of Current Research and Academic Review

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07.10.2023 - AFTERNOON SESSION

VALEDICTORY FUNCTION @ 2.30 pm

Valedictory Address : **Dr. P.L. CHITRA**
Professor and Head I/C,
Department of Network System and Information Technology,
Department of Computer Science,
University of Madras

Release of the Conference Proceedings & CD : **Dr. I. Arlamma**
Academic Advisor
St. Anne's Arts and Science College

Certificate Distribution

Expression of Appreciation : **Dr. I. Annammal Arputhamary**
Principal

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NATIONAL CONFERENCE ON RECENT TRENDS IN SCIENCE AND TECHNOLOGY
(SAASC - NCST '23)

Organized by
IQAC
&
Departments of Computer Science, Computer Applications , Mathematics & Microbiology

THE MANAGEMENT, STAFF AND STUDENTS OF

The Departments of Computer Science , Computer Applications, Mathematics & Microbiology

Cordinally Invite You to Grace the Inaugural Function of Our

NATIONAL CONFERENCE
on
RECENT TRENDS IN SCIENCE AND TECHNOLOGY
(SAASC - NCST '23)

Inaugural Function
07.10.2023 @ 9.30 am

Venue : MOTHER GNANAMMA CONFERENCE HALL

Rev. Mother Dr. Leema Rosario
Chairperson
ST. ANNE'S ARTS AND SCIENCE COLLEGE
has kindly consented to deliver the Inaugural Address

Chief Guest
Dr. V. B. KIRUBANAND
Associate Professor, Department of Computer Science
Christ University
has kindly consented to deliver the Presidential Address

SMT. Benedict Kumari
Dean College Development

Dr. I. Annammal Arputhamary
Principal

PROGRAMME SCHEDULE

07.10.2023 - FORENOON SESSION

Inauguration : 9.30 am

Inaugural Address : Rev. Mother Dr. Leema Rosario
Chairperson
St. Anne's Arts and Science College

Presidential Address : Dr. V.B. Kirubanand
Associate Professor
Department of Computer Science
Christ University, Bangalore

Tea break : 10.30 am

PAPER PRESENTATION BY PARTICIPANTS

In Person & Online

Resource Persons

VENUE 1

1. Dr. M. SUNDARA RAJAN
Associate professor, Department of Computer Science
Government College for Men, Nandanam

VENUE 2

2. Dr. A. AMBETH RAJA
Head & Associate Professor
PG Department of Computer Science
Thiruthangal Nadar College, Selaivayal

VENUE 3

3. Dr. K.PADMAVATHY
Professor, Department of Microbiology
Sree Balaji Dental College and Hospital, Pallikaranai.

ABOUT THE COLLEGE

St. Anne's Arts and Science College, Chennai has been an institution that has focused on achievements in the field of higher education for young women. The future belongs to those who believe in the beauty of their dreams. Our foundress **Thatipathri Gnanamma** is our role model, whose vision and dreams have served as an inspiration for hard work and determination.

Our journey of stepping into higher education started with the courage and will power of our Chairperson, **Rev. Mother Dr. Leema Rosario**, whose path to success towards higher education was through determined action. The College strive to achieve academic excellence, by providing quality education through excellent teaching-learning activities, research pursuits and through a continuous assessment of academic activities. This is to empower young women to evolve as self-reliant citizens of the global village who would cater to human welfare and sustainability.

Vision: To provide humanizing and liberalizing education so as to form responsible citizens who in solidarity with others will create a just Society.

Mission:

- To empower youth with knowledge, skills and competence
- To provide the students with opportunities to understand the present society and critically analyze its structures
- To form their character and personality.
- To mold them into socially responsible youth.
- To enable them to create a more humane and harmonious society.
- To produce world class leaders with a difference.
- To create integrated and visionary leaders.

ABOUT THE DEPARTMENTS

DEPARTMENT OF COMPUTER SCIENCE

The Department of Computer Science was established in the year 2014-2015. This programme trains its students to showcase their skills as Software Developers, System Integrators and System Analysts among other job profiles.

DEPARTMENT OF COMPUTER APPLICATIONS

The Department of Computer Applications was introduced in 2014-2015. The course has been designed to provide a strong foundation in the area of computer applications and equip learners with the required skills needed in the industry and academia.

DEPARTMENT OF MATHEMATICS

The Department of Mathematics had its inception in the year 2014. The department prepares young minds to become efficient mathematicians and has been at the forefront in producing commendable results in the university examinations. The faculty of the department of mathematics focus on enabling students to become lifelong learners and grow in their chosen professions.

DEPARTMENT OF MICROBIOLOGY

The Department of Microbiology was started in 2022 enhanced with well-equipped laboratory. All the faculties are well experienced in research and academics. The course is designed to provide job opportunities and research in various fields such as Pharmacy, Medicine, Clinical research, Agriculture, Dairy industry, Water industry, Nanotechnology & Chemical technology.

ORGANIZING COMMITTEE

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CONFERENCE ORGANIZING SECRETARY
Smt. M. R. Benedict Kumari,
Dean of College Development

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Prof .S. Elumalai

REGISTRAR

MESSAGE

Greetings from University of Madras.

In today's environment, keeping up with scientific and technological advancements is critical. Technology remains ever-evolving, and being current on the newest trends may help you stay viable in the job market, get access to new features and capabilities, and save time and money in the long term.

Thanks to publications like these, the scholarly community's enthusiasts have access to a range of avenues that have been identified thus far to acquire a broader perspective on the themes under consideration. This publication is one of several literary packages that have been issued in an attempt to meet this never-ending demand, each one better than the one before it.

The fundamental purpose of this research paper is to emphasize the progress made in the concept of Recent Trends in Science and Technology. As the writers hope to contribute their own distinct points of view on the themes they have selected, I want the conference to have the finest connections possible between academicians, research scholars, professors, and postgraduate students at the national level.

I wish this National Conference a great success and express my greetings to all the organizing committee patrons and participants of this Conference.

S. Elumalai 05/10/23

REGISTRAR

MESSAGE FROM THE CHAIRPERSON

The Departments of Mathematics, Computer Science, Computer Applications, and Microbiology deserve my heartfelt thanks for joining forces to organize this National conference, which aims to investigate the 'Recent Trends in Science and Technology' which is the vital foundation of the contemporary age. At this National Conference on these forefront areas of science and technology, academics, scholarly researchers, business executives, and students will have the opportunity to network and exchange ideas. Science and technology are areas that are perpetually evolving, and new trends and advances arise on an ongoing basis allowing for faster change and advancement and leading the rate of change to accelerate. However, it is not simply technology trends and upcoming technologies that are changing, humans need to constantly be learning, unlearning, and relearning to keep up to its pace. I give my heartfelt appreciation and blessings to the effective team who have meticulously planned every detail to ensure that this conference makes an impact on the people who attend.

Rev. Mother Dr. Leema Rosario
Chairperson

MESSAGE FROM THE PRINCIPAL

In a world where innovation knows no bounds, staying informed about the latest trends and breakthroughs is paramount. The pace of technological advancement has never been as rapid as it is today. From artificial intelligence and quantum computing to biotechnology and renewable energy, our world is constantly reshaped by the transformative power of technology. As we find ourselves at the nexus of innovation and progress, it is imperative that we not only comprehend these trends but also contemplate their implications on society, economy, and humanity as a whole.

The National Conference seeks to foster a deeper understanding of these advancements by providing a platform for scholars, researchers, industry experts, and enthusiasts to share their insights, analyses, and perspectives. Our aim is to bridge the gap between cutting-edge research and real-world application, enabling a more informed and responsible adoption of emerging technologies. I'd like to thank the conference team for all of their efforts and send them my best wishes for their future aspirations.

Dr. I. Annammal Arputhamary
Principal

MESSAGE FROM THE DEAN

In a world where the boundaries of scientific discovery and technological innovation are being pushed further each day, this National Conference emerges as a beacon guiding us through the ever-shifting landscapes of progress and possibility. It will serve as a repository of knowledge, a forum for discussions, and a source of inspiration for those who are passionate about the transformative potential of technology.

I wish everyone on the team the very best of success and sincere blessings on organizing this National Conference. This conference will enable attendees to engage in a vigorous intellectual discussion that will call for ground-breaking interventions and directions for future study in Recent Trends in Science and Technology and its application in today's world.

Smt. Benedict Kumari
Dean of College Development

ACKNOWLEDGEMENT

"Expressing gratitude is a wonderful way to enhance our lives"

The Departments of Mathematics, Computer Science, Computer Applications, and Microbiology successfully organized the National Conference on Recent Trends in Science and Technology. We would like to convey our sincere gratitude to our chairperson, **Rev. Mother Dr. Leema Rosario**, for her continuous support and blessing in organizing the National Conference as well as for agreeing to give the opening address.

Dr.V.B.Kirubanand, Associate Professor, Department of Computer Science, Christ University, Bangalore, kindly offered to attend the event as the Chief Guest and deliver the President's address, and we are happy to express our gratitude for that. We greatly appreciate **Dr.P.L.Chitra**, Professor and Head I/C, Department of Network System and Information Technology, Department of Computer Science, University of Madras for graciously agreeing to attend the Valedictory Session as the Guest of Honor. Academics, research scholars, faculty, and graduate students have responded in large numbers on both a national and state level. They have offered some excellent insights, opinions, and recommendations on the major issue, which may be influential to many people around the country.

We would like to extend our sincere gratitude to our Principal, the Dean of College Development, the College Advisor, and each and every member of our team for their tireless efforts in making the conference a huge success. We would like to sincerely thank each and every one of you for contributing to the success of the conference. Future conferences of this kind that offer academicians, research scholars, faculty, and postgraduate students a place to discuss various topics are something we hope to see more of in the near future.

Department of Computer Science
Department of Computer Applications
Department of Mathematics
Department of Microbiology

National Conference on Recent Trends in Science and Technology

(SAASC - NCST ' 23)

IJCRAR 2023

7th, October, 2023

INVITED FULL LENGTH ARTICLES

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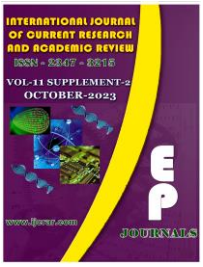

Full Length Article **IJCRAR/FL/01**

An Effective Method for Privacy-Preserving Federated Learning: Hybrid Alpha

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[1]Research Scholar, Department of Computer Science, Vistas, Chennai, Tamil Nadu, India
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Abstract

A promising strategy for collaborative learning that protects privacy is federated learning. A model is jointly trained by participants in a federated learning process by the exchange of model parameters as opposed to the actual data used for training, which they may choose to keep private. The resulting model and parameter interactions, however, may nevertheless reveal details about the training set. Different techniques, including those on the basis of differential privacy and SMC (Secure Multiparty Computation), have been suggested to overcome these privacy concerns. They frequently lead to lengthy communication chains and sluggish training times. We provide HAlpha, a method for federated learning that preserves users' privacy by making use of an SMC protocol that is founded on functional encryption, in this piece of research. This procedure is straightforward, effective, and tolerant of participants quitting. We assess our strategy for training a CNN on the MNIST data set in terms of the amount of training time and data exchanged. While comparing other crypto-based SMC solutions, HAlpha is able to reduce training time and data transfer volume by an average of 92%, all while maintaining a similar model performance level and privacy guarantees.

Keywords: Blockchain, Security, Privacy Preserving Protocols and Distributed AI, Neural Network, Federated Learning.

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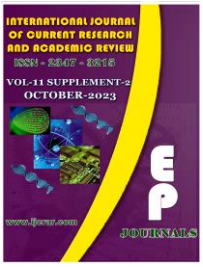

Introduction

A wide range of fields have benefited from the application of machine learning (ML) in both industry and academia [23, 26]. The interest in decentralized learning frameworks, which allow several users to work together to train an ML model without sharing their own training data sets, is driven by privacy concerns as opposed to standard ML approaches, which rely on a centrally maintained training data set. A decentralized method called FL (Federated Learning) [25, 28] was put forth as having the capacity to grow to participants in thousands. Due to the fact that the training data is kept within every participant's domain, FL is appropriate for the utilization of cases where data sharing is sensitive. Financial services, health care, and other industries with heightened privacy concerns or subject to statutory requirements are included.

In FL, each person constructs a model on their own and only exchanges model parameters with the other participants, not the active, private training data, of other participants. The model parameters of various participants are combined by an entity known as an aggregator. There are different topologies that have been employed, for example, placing an aggregator in close proximity to every participant, in most cases, an aggregator is a centralized body that additionally redistributes the combined model parameters to all of the participants. Private information can be extracted from a trained model [37], and a model inversion attack [19] was disclosed. Despite this, the method still presents potential risks to users' privacy.

In order to prevent such invasions of privacy, a learning framework with differential privacy [15, 17] was suggested [1, 31]. In this approach, a dependable aggregator will manage the potential for privacy exposure in order to preserve the confidentiality of the output of the model. Similar to [32], [6] suggests integrating authenticated encryption and secret sharing in a failure-robust protocol for high-dimensional data safe aggregation, While [32] suggests merging SMC with differential privacy techniques to give privacy-preserving analysis of sensitive data through many data sources.

A hybrid approach which gives a strong guarantee for privacy while yet permitting high model performance was also presented in a recent study [38], It took inspiration from the hybrid approach [32]. The threshold Paillier system, a hybrid security solution, combines noise-reduction

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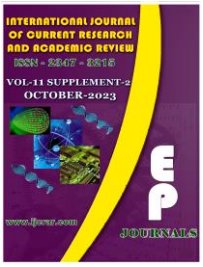

differential privacy with SMC protocol protection [11]. Its primary security pillar is additive homomorphic encryption.

A privacy-preserving FL framework, in our opinion, should aim toward robust privacy assurances, high communication effectiveness, and adaptability to changes.

We suggest Hybri-dAlpha, an effective method for FL privacy preservation, to address the aforementioned issues. SMC is carried out by HybridAl- pha utilizing functional encryption. We develop a simple and effective FL privacy-preserving strategy by utilizing functional encryption. This approach not only permits a participant group which can change throughout the duration of the learning procedure, but it also protects users' personal information. Following is a summary of our major contributions:

We suggest HybridAlpha, a practical privacy-preserving FL technique that builds a multi-input functional encryption scheme's SMC protocol from a differential privacy mechanism. In order to lessen the probability that suspicious aggregators & complicit participants may be able to deduce private data, we modify this approach and add additional safeguards.

We put into practice a functional encryption technique and contrast it with conventional, Traditional cryptography systems which are additive homomorphic encryption and their modifications are classically utilized for the SMC.

We outline a Hybrid Alpha implementation and use it with a CNN. The results of the experiments conducted on the MNIST dataset indicate that, while keeping the same degree of model performance and privacy guarantee, our hybrid alpha framework is more efficient than previous approaches in terms of training time & communication costs.

At the equal time, we establish how to find a solution to the issue of changing participant groups, proving that our suggested structure is resistant to participant addition or dropout. We also evaluate the Hybrid Alpha framework's security and guarantee ofprivacy in the context according to our anticipated risk scenario, which includes a reliable TPA, trustworthy but curious aggregators, and somewhat misleading participants.

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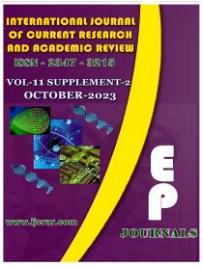

We show that, when compared to other methods, our methodology offers higher model performance, a stronger guarantee of privacy, shorter training times, and more effective communication.

The remainder of the essay is structured is mentioned. The backdrop and introduction are covered in Section 2. The presentation of our Hyrbid Alpha framework as well as the related threat model can be found in 3. In section 4, the evaluation and an analysis of security and privacy are each offered. In section 5 we discuss the Conclusion.

Background and Preliminaries

In this given section, we provide background information and describe the fundamental components of the system we offer.

Privacy-Preserving FL

The 1st FL design made sure that every participant would save their data locally and communicate model parameters just once in order to guarantee data privacy [28]. Although they first provide the impression of offering some anonymity level, assaults in the literature show that it is easy to determine personal data [19, 30, 37]. It is vital to secure privacy not just for the computation but also for the output in order to completely preserve the confidentiality of the training data by inference attacks.

Privacy in Computation

Malicious individuals in FL training might be motivated to infer other people's private information. Model upgrades that disclose personal information are included in messages sent to the aggregator. For instance, if a text-based classifier is trained using a collection of words as embedding, an adversary might be capable of calculating the words which have been used by looking at the gradients (non-zero gradients, for example, represent words utilized). Inference attacks can be defended against during training using SMC procedures. These protocols make it such that aggregated data can be calculated while preventing the disclosure of specific results.

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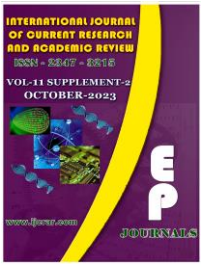

Privacy in Output

Privacy of the result. Additionally, private data from the training set can be exposed by machine learning models [19, 30, 37]. In this situation, opponents can continually ask the model if a specific observation was included in the training data. Differential privacy was suggested as a defense against these attacks. To safeguard specific records in the training dataset, noise is thus supplied to the model.

Hybrid-Alpha Framework

In this part, we outline the precise design of our Hybrid-Alpha architecture for federated learning that protects user privacy. Our strategy prevents inference attacks by curious aggregators and limits cooperating participants' capacity to infer information, which is in line with the threat model.

A general overview of Hybrid Alpha is shown in Figure 1. Participants desire to jointly acquire a machine learning model by not revealing any of the personal data to other system elements. They settle on merely providing an aggregator with model updates. For the purpose of creating a shared machine learning model, it is the responsibility of this organization to compile model updates from diverse participants.

The goal of participants is to safeguard their data from any inference attacks made both at the time of FL procedure and by the final model.

In order to accomplish this goal, they combine a Hybrid Alpha by a TPA (Third Party Authority). This organization offers a key management service which starts the cryptosystem and also gives all parties usable encryption keys. In addition to this, Hybrid Alpha comes equipped with an Inference Prevention Module. This module places constraints on the different kinds of functional encryption keys that can be used to encrypt data. The goal of these constraints is to prevent information from escaping. This module is made to make sure that intrepid aggregaters cannot access the decryption keys and to prevent possible collusion attacks. This module is described in depth in 3.2.2.

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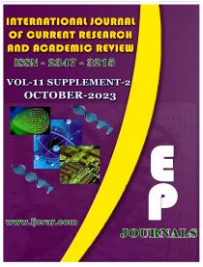

Threat Model

The following threat model is one we take into consideration.

Sincere-but-curious aggregator

We anticipate that the aggregator will successfully follow the method as well as procedures, although it might attempt to gather personal data by examining the model updates submitted through process participants. It's a commonly accepted opinion [6, 38].

Participants who are curious and conspiring

By examining the messages they exchange with aggregator or the final model, we think that participants might join together to attempt to gain private data through other participants.

Trusted TPA

Organizations that can perform this function already exist in several economic sectors. This organization is an independent agency that enjoys high levels of trust from both participants and the aggregator in practical situations. In the banking business, for example, central banks usually plays a completely trusted role, however in other industries, the TPA might be represented by a 3rdparty company as both a service or consultancy agency.

We also draw attention to the fact that many cryptosystems in use today assume the presence of such reliable, impartial organizations since they were built on the TPA's foundational architecture. The master public &private keys should be held by the TPA. The TPA is also trusted to generate function-derived secret keys and distribute public keys. The same is true of the Inference Prevention Module.

We assume that all communications take place via secure channels, preventing man-in-the-middle and minor eavesdropping attacks. In order to safeguard key confidentiality, In addition, we presume that a trustworthy mechanism of key provisioning, for example, Diffie-Hellman, is

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already in place. The scope of this study does not include attacks that try to introduce malicious model updates or denial of service attacks.

According to the threat model explained earlier, the privacy-preserving framework that we have proposed can ensure two things:"(i) the semi-honest aggregator can only learn the information that the differential privacy mechanism is required to create, and (ii) the malicious colluding participants could not learn the parameters of many other participants" who are honest. Both of these things are based on the fact that a differential privacy mechanism is required to create the information. In Section 5, the comprehensive study of security and privacy is presented.

Fig.1

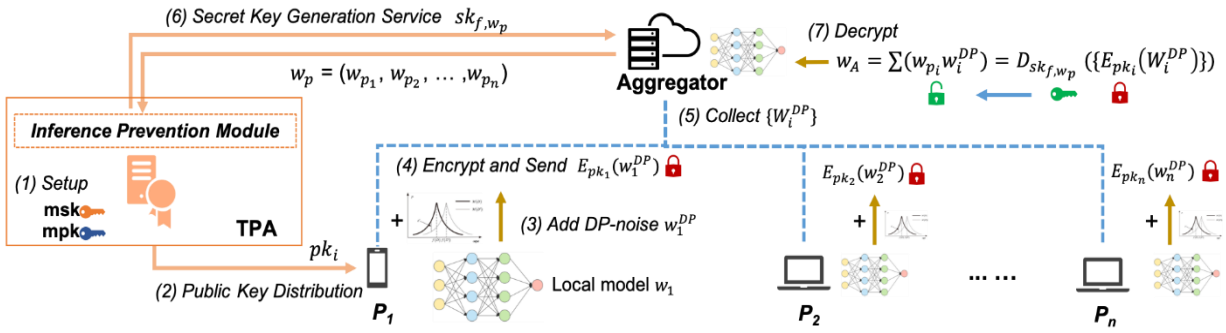

Figure1:Framework overview of our proposed efficient approach for privacy-preserving federated learning. Note that we only present one epoch here. Each participant does the local training based on their owned dataset, and then sends out the model parameters using our proposed efficient privacy-preserving approach.

Algorithm1:"HybridAlpha

Input: *F* **L**:=Machine learning algorithms to be trained;

ϵ :=privacy guarantee; :=set of participants, where
i;holds its owndata set *i*; *N*:=maximum number of expectedparticipants;
t:= minimum number of aggregated replies

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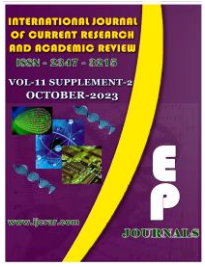


Output: TrainedglobalmodelM

function *TPA-initialization(*1λ,*N*,SP*)*
mpk,**msk**←MIFE.Setup(1λ,F1)s.t.*N*≫|SP|;
foreachP*i*∈SP**do**
pk*i*←MIFE.PKDistribute(**mpk**,**msk**,P*i*);
end
function *aggregate(*LFL,SP,*t)*
foreachP*i*∈SP**do**
asynchronouslyqueryP*i*withmsg*q*,*i*=(LFL,|SP|);
end
do
Smsgrecv←collectparticipantresponsemsg*r*,*i*;
while|S*msgrecv*|≥*t**and**stillinmaxwaitingtime*;
if|S*msgrecv*|≥*t***then**
specify*w*Pvector;requestthe**sk***f*,*w*PfromTPA;
M←MIFE.Decrypt(**sk***f*,*w*P,*w*P,Smsgrecv);
end
returnM
function*participant-train(*ϵ,*t*,*msgq*,*i*,D*i*,***pk****i)*
M*i* ←LFL(D*i*);
M*DP* ←DP(ϵ,M*i*,*t*);
msg*r*,*i*←MIFE.Encrypt(M*i*,**pk***i*);
sends msgr,i to aggregator;"

Experimental Setup

We trained a CNN (Convolutional Neural Network) having a similar topology as being the only which is utilized in [38] to categorise the publicly accessible MNIST dataset of the digits which is handwritten [27] in order to evaluate Hybrid Alpha's performance. The CNN has a cross-entropy loss softmax layer with ten classes and 2internal layers of ReLU units. There are 60 neurons present in the 1st layer and 1000 neurons present in 2nd layer. There are 118110 parameters in this CNN in all. The same hyperparameters reported in earlier research are also used here: 0.1 is a

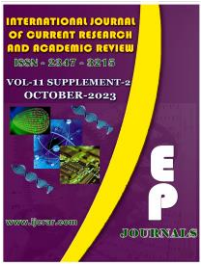
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



learning rate and a 0.01is a batch rate. Additionally, we utilize an epsilon of 0.5 and a norm clipping of 4.0 for differential privacy. We utilized the [38] noise-reduction technique as differential private mechanism.

Security and Privacy Analysis

We examine the privacy and security of our suggested framework by the3 distinct viewpoints, namely, the security provided by the MIFE scheme, the privacy assurances provided by the framework, and the defense against a variety of different inference attacks. The privacy of both the output model and the aggregation calculation is something that can be guaranteed by the FL framework that we have suggested.

The Output Model's Privacy. Utilizing strategies that have already been discussed in research, we provide differentiated privacy guarantees

Computational Privacy. In the SMC protocol's underlying infrastructure, multi-input functional encryption, we calculate the weighted average of the locally trained models of the participants. As mentioned in Section 5.1, the MIFE system is safe, preventing hostile attackers from accessing any plaintext that is protected by it. The MIFE approach ensures "that the decryptor, or aggregator in our framework for FL, could only access the function outcomes, or the average weight, and not the original data or the weights for the local models" of the participants.

Conclusion

Federated learning makes a commitment to handle privacy issues and mandate compliance, for example with the GDPR [39] and HIPAA [3]. Though, current solutions to federated learning's privacy issues offer strong guarantees for privacy &good model performance at the expense of longer training times and more expensive transmission of the network. To solve these problems, we suggest Hybrid Alpha, a cutting-edge federated learning platform.

Our theoretical and practical study demonstrates that, when compared to current methods, Hybrid Alpha can, on average, cut time of training by 68% and transfer a data volume by 92%

EXCELLENT PUBLISHERS

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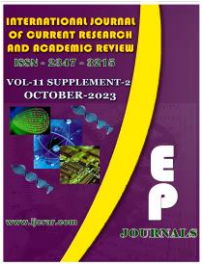

without compromising model performance or privacy assurances. Hybrid Alpha allows for the application of federated learning with strong privacy assurances to use cases that are concerned with the time of training and communication above, particularly for the models that contain a lot of features.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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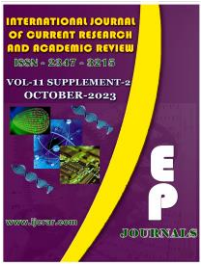

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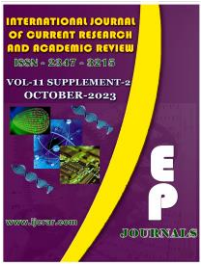
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Full Length Article **IJCRAR/FL/02**

Effectiveness of Flipped Classroom Strategy for Enhancing Achievement among Student Teachers at Bachelor's Level in the State of Kerala

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Abstract

In recent years, there has been comparable advancement in technology and the Internet for education. A Flipped Classroom is a convenient, innovative teaching approach for individualized learning that enhances achievement. This study investigates the effectiveness of the Flipped Classroom strategy for enhancing achievement among Student Teachers at the Bachelor's Level in the State of Kerala. It also examines the challenges of using the Flipped Classroom as a strategy. The study adopted a quasi-experimental pre-test and post-test design. Eighty B. Ed student teachers were selected as participants, and Samples were collected using the purposive sampling method. The research tool used was an achievement test for the chosen topic, modern trends in assessment, and feedback items for examining the challenges faced using Flipped Classroom. The experimental group was treated using a Flipped classroom, and the control group was taught using an ICT-enabled Lecture method and administered a pre-test and post-test for both control and experimental groups. Mean, standard deviation and t-tests were used to analyze the data. The study also used a questionnaire to get feedback about the challenges faced using Flipped Classroom. The results revealed that the flipped classroom is an effective strategy that can significantly enhance students' achievement in the topic of modern trends in assessment. Based on these findings, it was concluded that flipped classroom instruction enhanced student achievement more than conventional lecture methods. Therefore, the study recommended using flipped classrooms in colleges of education to improve students' achievement.

Keywords: Flipped classroom, strategy, conventional method, Achievement, video conferencing systems.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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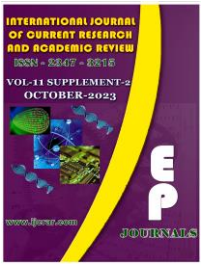

Introduction

Innovation in education is a new development, not a destination or limit. The need for restructuring traditional teaching and shifting the sage's role on the stage to that of the side-by-side facilitator paves the way for student-centered active learning methodologies that mitigate the drawbacks of conventional teaching strategies. The broad adoption of flipped classrooms is possible by developing technical tools, including interactive videos, interactive in-class activities, and video conferencing systems. Digital tools, innovative pedagogies, and approaches are needed to deliver inclusive and high-quality instruction in virtual communities. Flipped Classroom is an innovative and creative pedagogy in which information dissemination is changed from the traditional face-to-face classroom environment to outside-the-classroom settings, which can engage students and support their learning in face-to-face, blended, and online environments (Dawson, 2015). Students read instructional material, observe lecture recordings at home, and participate in teacher-led interactions, problem-solving, and analysis in class rather than attending class lectures and doing homework assignments.

The flipped classroom is "changing direct learning out of the big group learning environment and moving it into the individual learning space, with the support of one of the numerous technologies (Hamdan, 2013). More personalized teaching for students is possible because of the framework produced by flipping the classroom. The Flipped classroom is a novel educational approach in which students are taught relevant material asynchronously through an external platform where the instructor shares preset digital resources. (Kong, 2014) The flipped classroom concept enables teachers to share their educational practices, have reflective discussions, and improve available resources.

Theoretical background of the study

New technological advancements have brought changes and challenges from traditional to more advanced modes of teaching and learning. Teachers are required to be equipped with technology-enabled strategies in the classroom for the meaningful transaction of content. To describe the transition from traditional chalk-and-talk instruction to technologically based web- based learning, e-learning, M-learning, e-resources, cloud computing, and hybrid learning. The Flipped

EXCELLENT PUBLISHERS

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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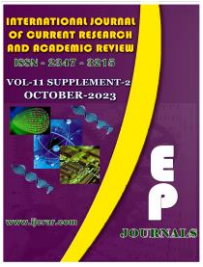
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Classroom is a blended mode combining electronic-based learning and a traditional learning environment**.** The history of the first Flipped Classes was taught by two chemistry teachers, Jonathan Bergmann, and Aaron Sams, in 2012 (Bergman, 2012). The theoretical aspect of Flipped Classroom has derived from many learning theories of John Dewey, Francis

Bacon, David Ausubel, and Edgar Dale. Theories that affirm learning by doing, participating in practice, learning as a change in identity, and context-mediated learning are fundamental core ideas shared by Flipped Classroom. Students construct new knowledge by assimilating it with previous knowledge. Various approaches like guided discussion, simulations, and video analysis supported experiential learning in this flipped classroom. A collaborative and constructive learning environment plays a vital role in Flipped Classroom. Constructivism can provide a suitable framework for the flipped classroom when combined with a hybrid approach that combines in-person experiences and instruction with online learning opportunities and material delivery. When integrated with constructivism, it can provide an appropriate framework for the flipped classroom. The engagement, exploration, explanation, elaboration, and evaluation phases are all parts of the five-phase process known as the 5E Instructional Model, which defines constructivism [20). Constructivists use multidimensional cognitive learning to promote socialization, brainstorming, sharing different viewpoints, and collaboration. By reading lecture notes or viewing videos, students can learn at home at the lowest levels of "Bloom's Taxonomy," which helps them remember and recognize the information. The students can engage in skill-based activities independently or in groups. Integrating educational initiatives and technological tools by student teachers at the bachelor's level is crucial for inspiring students' imagination, creativity, and self-assurance.

Technology-enabled strategies are used in education to meet the changing needs of the time. It focuses on the implications related to the teaching-learning process's efficiency and effectiveness. Integrating technology into learning describes the development of hybrid blended learning, which utilizes both classroom and class environments. For the sake of the study, a technology-innovative approach to strategy is considered. As a result, a Flipped Classroom—a novel approach to employing technology in the classroom—is proposed. Flipping a coin yields a 50:50 chance of the desired effect, while flipping a classroom is more likely to result in a far higher case of learning. A Flipped Classroom is one where homework assignments typically completed in

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

class are completed at home and vice versa. Flipped Classroom is an experiential learning approach that creates information through transforming experience and is a method for effective learning that replaces teaching from the classroom.

Need and significance of the study

The limitations and drawbacks of traditional or conventional teaching strategies are their inability to create meaningful learning environments where students can generate knowledge or collaborate. Conventional procedures or approaches aid the rote memorization of concepts. If the students are exposed to innovative technology-aided teaching strategies, they may make learning relevant and comprehend the material meaningfully. Requirements for meaningful learning are conceptual clarity of the content being taught, assimilation with prior knowledge, and collaborative activities or techniques used in the classroom.

Despite the expanding body of knowledge and shifting demands and competencies, the need for developing effective strategies has increased. The investigator's direct experience and awareness regarding the teaching methodology convinced there is a need to study the effectiveness of Flipped Classroom on achievement. The researcher has functioned as a teacher educator for student teachers at the bachelor's level and continually felt the lacuna of strategy that can enhance the collaborative and constructive manner in enhancing meaningful learning. This search led the researcher to use the Flipped Classroom Strategy to enhance the achievement of student teachers at the bachelor's level. Several studies have been done in various blended learning modes still found the gap in the area of Flipped classroom strategy.

Literature Review

In recent years, several studies have focused on the impact of Flipped Classrooms on students' achievement. (Bergman, 2012). A study revealed several benefits of a Flipped Classroom, which enhances student-teacher interaction, Customizable and flexible instruction Flipped Classroom enables teachers to use class time for more student-centered engagement and problem-solving and improves student attitudes**.** (Guerrero, 2015). A study on nursing students (Janotha, 2016) reveals that Flipped Classroom impacts achievement (Sourg, 2023) studied the effectiveness of

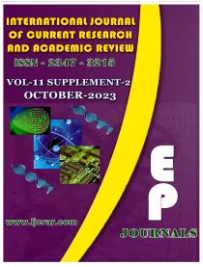
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Flipped Classrooms on academic achievement among medical students. (Alsancak Sirakaya, 2018) Studies reveal that flipped classrooms significantly affect academic achievement, readiness, motivation, and retention. The flipped classroom strategy could improve the attitude of students, thereby enhancing their academic achievement (Nja, 2022) Flipped Classroom instruction enhanced students' academic achievement more than the conventional lecture method (Hassan, 2023). The flipped Classroom method is effective and affects academic achievement positively.

Objectives of the Study

- To determine the significant difference between the Pre-test and Post-test scores of the Control Group Student Teachers in their Achievement.
- To find out the significant difference between Pre-test and Post-test scores of Experimental Group Student Teachers in their achievement.
- To find out the significant difference between the Control and Experimental Group Student Teacher in their pre-test scores of Achievement.
- To find out the significant difference between the Control and Experimental Group Student Teacher in their post-test scores of achievements.
- To examine the challenges of using Flipped Classroom among student teachers at the bachelor's level.

Hypotheses of the Study

To achieve the objectives of the study, the null hypothesis was formulated as,

$H0_1$: There is no significant difference in Achievement between the Pre-test and Post- test scores of the Control Group Student Teachers.

$H0_2$: There is no significant difference between Pre-test and Post-test scores of Experimental Group student Teacher in their achievement.

$H0_3$: There is no significant difference between the Control and Experimental Group Student Teachers in their Pre-test Scores of Achievements.

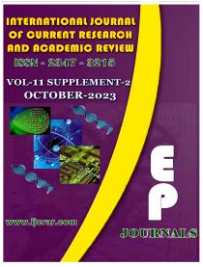
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



$H0_4$: There is no significant difference between the Control and Experimental Group Student Teachers in their post-test scores of achievements.

Methodology

The present study used a quasi-experimental method. Detail of the methodology, like the study's design, population, sample, tool, data collection, and data analysis, are discussed as follows.

Research Design

The investigator adopted a pre-test, post-test equivalent group experimental design.

Sample and the Sampling Procedure

The sample for the present study is a student teacher studying at Mar Thoma Teachers Training College, Ranni, Kerala. The study was conducted on a sample of 80 students. The students were divided into two groups, i.e., the control group, 40 students, and the experimental group, 40 students. The investigator adopted the purposive sampling technique to select the respondents.

Tools used

The investigator used the following tools.

1. Achievement test for modern trends in assessment is constructed to administer pre-test and post-test for the control and experimental groups.
2. A questionnaire for students' feedback to examine the challenges of using Flipped classroom.

Procedure of the Study

The researcher obtained permission from the head of the institution. A total of 80 Participants were assigned to the study; the Experimental group (40) and the control groups (40) were selected using purposive sampling. Both the groups were pre-tested using a researcher's made achievement test for the topic of recent trends in assessment. The researcher taught the

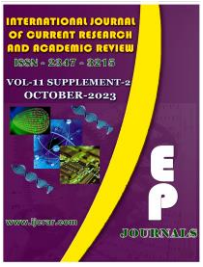
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



experimental group using flipped classroom strategy for selected topics from modern trends in assessment. One day before the session, the Experimental group was provided with learning materials, including pre-recorded video lectures, relevant articles, e-books, TED talks, Blog pages, YouTube links, and PowerPoint slides summarising the subject. The student was expected to read all the reading materials. The next day in the classroom, students were divided into groups for discussion, work collaboratively, brainstorming, team activities, and quizzes related to the topic.

The control group was taught the same topics through the lecture method using ICT-enabled resource material. After the treatment, both groups were post-tested using an achievement test. Data collected were analyzed using appropriate statistical techniques to study the effectiveness of flipped classrooms. In the end, feedback from participants was taken to examine the challenges of using the flipped classroom strategy.

Analysis and Result

Table.1 Data and Result of the Significance of Difference between Mean Pre-Test and Post-Test Scores of a Control Group

Test Conducted	Number Of Students	Mean	Standard Deviation	t	Level of Significance
Pre-test	40	12.8	4.96	1.718	Not significant at.05 level
Post-test	40	14.45	3.51		

The table above indicates that the obtained 't' value 1.718 is insignificant (P>0.05). This shows no significant difference between the means of pre-test and post-test scores of the control group on achievement.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

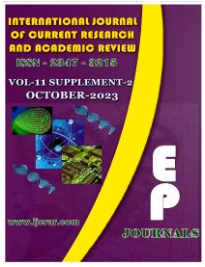


Table.2 Data and Result of the significance of difference between Mean Pre-test and Post-test scores of an Experimental group

Test Conducted	Number of Students	Mean	Standard Deviation	t	Level of Significance
Pre-test	40	13.27	5.060		
Post-test	40	18.9	3.83	5.6	Significant at 0.01 level

The table above indicates that the obtained 't' value of 5.6 is significant (P<0.01). The mean of the post-test is greater than the pre-test. This shows a significant difference between the means of pre-test and post-test scores of the experimental group on achievement. So it can be concluded that Flipped classroom strategy significantly impacts students' achievement.

Table.3 Data and Result of Test of Significance of the Mean Pre-Test Scores of the Experimental and Control Groups

Group	Number of Students	Mean	Standard Deviation	t	Level of Significance
Experimental Group	40	13.2	5.06		
Control Group	40	12.8	4.96	0.36	Not Significant at 0.05 level

The obtained 't' value 0.36 is insignificant (P>0.05). This shows no significant difference between the mean pre-test scores of students in experimental and control groups on achievement. From this, it can be concluded that the students of the two groups are almost equal in their academic ability.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Table.4 Data and Result of Test of Significance of the Mean Post-Test Scores of the Experimental and Control Group

Group	Number of Students	Mean	Standard Deviation	t	Level of Significance
Experimental	40	18.9	3.83	5.48	Significant at 0.01 level
Control	40	14.45	3.51		

The test of significance 5.48 (P<0.01) indicates a significant difference in the post-test scores of the two groups. The result shows that the experimental group exposed to flipped classroom teaching approach had a better achievement regarding the total scores. The mean scores help to state that the experimental group is in an advantageous position. The experimental group's mean (18.9) is greater than the control group's (14.45). So, it can be concluded that the Flipped Classroom strategy for teaching has a more significant impact on students' academic achievement than the conventional teaching method.

Challenges of Using Flipped Classroom Strategy among Student Teachers

The investigator adopted a questionnaire to examine the challenges of using Flipped classroom strategies among student teachers at the bachelor's level. The result reveals that around 60% opinioned that insufficient training, Guidance, and Skill to use the strategy is a significant challenge. Almost 80% responded that there was a lack of internet access as a challenge.34% opinioned that time does not seem to be a challenge while using strategy. Another 68% highlighted proper feedback mechanism. As a challenge. Using lengthy pre-recorded video lectures, YouTube videos were a challenge for 24%. Besides that, other challenges highlighted are skepticism to use innovative strategies, Appropriate planning for selecting resource material, lack of constructive feedback, and use of LMS. These are the different challenges faced when using Flipped Classroom.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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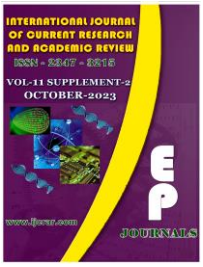
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Discussion and Suggestions

The result of the study shows that Flipped classroom is an effective strategy for enhancing. Achievement among student teachers at the bachelor's level. As evidenced by the significant differences in the post-test achievement scores of the Experimental group (Flipped Classroom) and the Control group (ICT-enabled lecture method). These findings align with the results of several studies. The result of the study conducted in Saudi Arabia highlights the effectiveness of Flipped classrooms on achievement performance and satisfaction (Alamri, 2018).

Another study's results reveal that the Experimental group taught using Flipped Classroom performed better than the Control group using the traditional method (E. Cabı, 2018). A meta-analysis of 177 studies proves that Flipped classroom enhances achievement (Yazar, 2021). The result of the study is corroborated by another study, revealing that Flipped Classrooms significantly affect critical thinking skills and achievement (Atwa, 2022).

On the challenges of using a Flipped classroom, findings from the study show that significant challenges are insufficient training, lack of constructive feedback, and use of resource materials; the findings align with the result of a (Akçayır, 2018) systematic review study. The students valued the ability to study at their own pace, the flexibility and mobility provided by easily accessible video lectures, and the fact that learning is simpler and more efficient when done in the context of a flipped (Nouri, 2016). In the flipped classroom approach, the students can find opportunities to discuss with their teachers, which is impossible in the traditional approach (Bergmann, 2012). Adopting this strategy, students can become more self-reliant in learning better through offline and online modes.

Studies show positively affects the metacognition level of students. It is also helpful in curbing the habit of absenteeism among students; such techniques are skillfully adopted (Ekta, 2021) Considering the study, it is suggested that the Flipped Classroom strategy can be used as a meaningful strategy (Bybee, 2003) among student teachers at the bachelor's level to enhance their achievement. Teachers should be given proper orientation and training in using Flipped Classroom through refresher courses and workshops. Student teachers should be motivated to use this to enhance their achievement.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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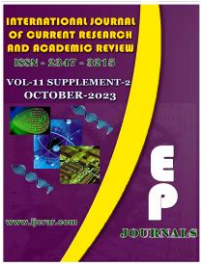

Delimitation of the study

Despite all the advantages mentioned study has some limitations

- The present study is conducted only for eighty samples of student teachers at the bachelor's level.
- The study is limited to only one B.ed college (Pathanamthitta) of Mahatma Gandhi University of Kerala.
- Due to lack of time, the present study is conducted only for a Recent Trends in Assessment module.
- Experimental duration for the study is only three weeks.
- The content will be from B.Ed. Syllabus of the concerned University for experimental purposes.

Conclusion

The study examined the effect of Flipped Classroom strategy on achievement among student teachers at the bachelor level in Kerala. The study also examined the challenges of using this strategy. The findings of the study conclude that Flipped Classroom is an effective strategy to improve student achievement significantly.

Flipped learning generates a reversed experience where the learner learns the subject independently before applying and reinforcing it in class. Teachers should be given proper training to maximize the benefits of innovative pedagogies. Flipped Classroom increases access to resources, experts, and learning opportunities.

Appropriate implementation of this strategy promises the inclusion of more personalized learning and collaboration. Implementations for adopting diverse teaching strategies include Flipped pedagogy, which offers a new paradigm shift toward the teaching-learning process. The flipped classroom model is growing popular to make the instructional approach more interactive. The flipped classroom paradigm has been shown to boost learner retention of information and make the time they spend in class more meaningful.

EXCELLENT PUBLISHERS

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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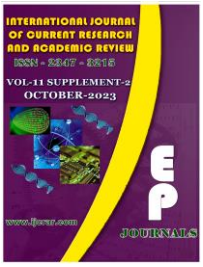

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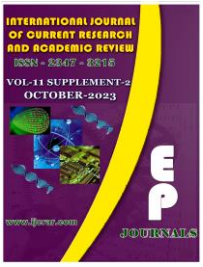

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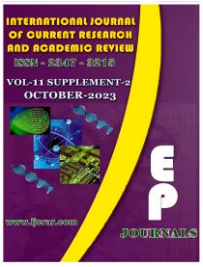

Full Length Article **IJCRAR/FL/03**

The Forcing Detour Metric Dimension of a Graph

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Abstract

Let G be a simple connected graph. Let $W = \{w1, w2,..., wk\} \subset V(G)$ be an ordered set and $v \in V(G)$. The $Dr(v/W)$ of v with respect to W is the k-tuple $(D(v, w1), D(v, w2),..., D(v, wk))$. Then W is called a detour resolving set if different vertices of G have different representations with respect to W. A detour resolving set with minimum number of elements is called $Ddim$-set of G and the cardinality of a $Ddim$-set of G is known as the detour metric dimension of G, represented by $Ddim(G)$. Let S be a minimum detour resolving set of G. A subset of $T \subseteq S$ is called a forcing subset of S if S is the unique minimum detour resolving set containing T. A forcing detour resolving subset for S of minimum cardinality is a minimum forcing detour resolving subset of S. The forcing detour metric dimension of S, $fDdim(S)$ in G is the cardinality of a minimum forcing detour resolving subset of S. The forcing detour metric dimension of G, $fDdim(G)$ = min $\{fDdim(S)\}$,where the minimum is taken over all minimum detour resolving subset of S. In this article forcing detour metric dimension of some standard graphs are determined.

Keywords: Detour distance, detour resolving set, detour metric dimension, forcing detour metric dimension.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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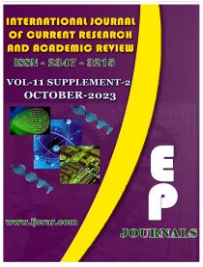

Introduction

Let G be a simple graph with vertex set $V(G)$ and edge set $E(G)$. The order of a graph G is $|V(G)|$, its number of vertices denoted by n. The size of a graph G is $|E(G)|$, its number of edges denoted by m. For basic graph theory terminology, we refer [1]. The *degree* deg (v) of a vertex $v \in V(G)$ is the number of edges incident to v. We denote by $\Delta(G)$ the maximum degree of a graph G. The *distance* $d(u, v)$ between two vertices $u, v \in V(G)$ is the length of a shortest path between them. The detour *distance* $D(u, v)$ between two vertices $u, v \in V(G)$ is the length of a longest path between them.

These concepts were studied in [3,4]. Let G be a simple connected graph. Let $W = \{w_1, w_2,..., w_k\} \subset V(G)$ be an ordered set and $v \in V(G)$. The $Dr(v/W)$ of v with respect to W is the k-tuple $(D(v, w_1), D(v, w_2),..., D(v, w_k))$.

Then W is called a detour *resolving set* if different vertices of G have different representations with respect to W. A detour resolving set with minimum number of elements is called *Ddim-set* of G and the cardinality of a *Ddim-set* of G is known as the *detour metric dimension* of G, represented by $Ddim(G)$. These concepts were studied in [2,5,6]. In this article, we study a new detour metric dimension called the forcing detour metric dimension of a graph.

The Forcing Detour Metric Dimension of A Graph

Definition 2.1

Let S be a minimum detour resolving set of G. A subset of $T \subseteq S$ is called a forcing subset of S if S is the unique minimum detour resolving set containing T. A forcing detour resolving subset for S of minimum cardinality is a minimum detour resolving subset of S.

The forcing detour metric dimension of S, $f_{Ddim}(S)$ in G is the cardinality of a minimum forcing detour resolving subset of S. The forcing detour metric dimension of G, $f_{Ddim}(G) = \min\{f_{Ddim}(S)\}$, where the minimum is taken over all minimum detour resolving subset of S.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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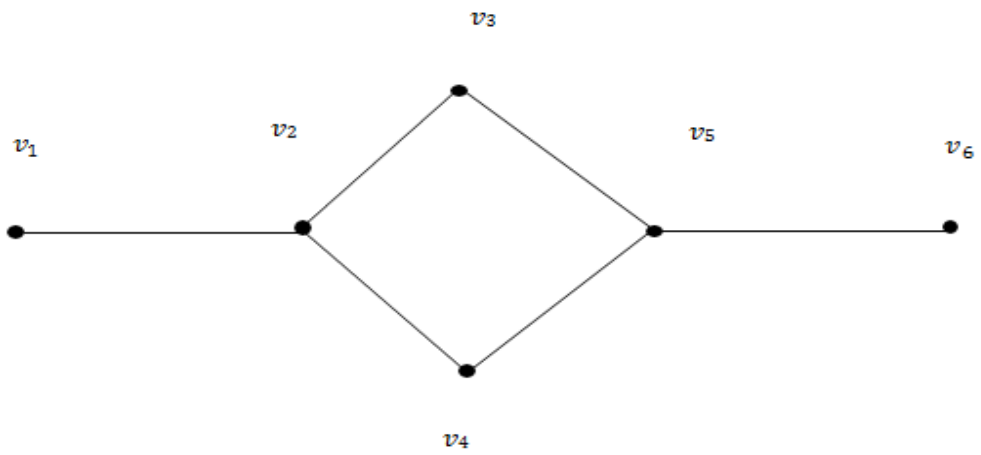
Example 2.2.

Fig.1



For the graph given in Figure 2.1, the minimum detour resolving sets are $S_1 = \{v_1, v_3\}$, $S_2 = \{v_1, v_6\}$, $S_3 = \{v_5, v_3\}$, $S_4 = \{v_5, v_6\}$. Therefore $f_{Ddim}(S_i) = 2$ for $i = 1$ *to* 4 so that

$f_{Ddim}(G) = 2$.

Theorem 2.3. For the graph $G = P_n$, $n \geq 4$, $f_{Ddim}(G) = 1$.

Proof: Let $V(P_n) = \{v_1, v_2, v_3, \ldots, v_n\}$.Then $S_1 = \{v_1\}$, $S_2 = \{v_n\}$ are the only two $Ddim$-set of G such that $f_{Ddim}(S_1) = 1$, $f_{Ddim}(S_2) = 1$ so that $f_{Ddim}(P_n) = 1$.

Theorem 2.4. For the cycle $G = C_n$, $n \geq 3$, $f_{Ddim}(G) = 2$.

Proof: Let $S = \{x, y\}$ be a set of adjacent vertices of G. Then S is a $Ddim$-set of G so that $Ddim(G) = 2$. Since x and y are arbitrary, S is not an unique $Ddim$-set of G containing either x or y, $f_{Ddim}(S) = 2$. Since this is true for all $Ddim$-sets S of G, we have $fDdim(G) = 2$.

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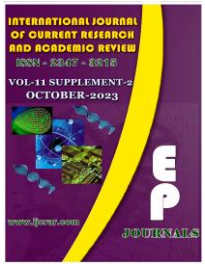

Theorem 2.5. For the complete graph $G = K_n$, $n \geq 3$, $f_{Ddim}(G) = n - 1$.

Proof: Let $S = V(G) - \{x\}$, $x \in V(G)$. Then S is a $Ddim$-set of G so that $Ddim(G) = n - 1$. Since x is arbitrary,S is not an unique $Ddim$-set of G containing x, $f_{Ddim}(S) = n - 1$. Since this is true for all $Ddim$- sets S of G, we have $f_{Ddim}(G) = n - 1$.

Theorem 2.6. For the graph $G = K_{1,n-1}$, $n \geq 4$, $f_{Ddim}(G) = n - 2$.

Proof: Let $S = V(G) - \{x, u\}$, where u is any end vertices of G. Then S is a $Ddim$-set of G so that $Ddim(G) = n - 2$. Since u is arbitrary,S is not an unique $Ddim$-set of G containing a set of $n - 2$ end vertices and so $f_{Ddim}(S) = n - 2$. Since this is true for all $Ddim$-sets S of G, we have $f_{Ddim}(G) = n - 2$.

Theorem 2.7. For the complete bipartite graph $G = K_{r,s}$, $2 \leq r \leq s$, $f_{Ddim}(G) = r + s - 2$.

Proof: Let $X = \{x_1, x_2, x_3,..., x_r\}$ and $Y = \{y_1, y_2, y_3,..., y_s\}$ be the two bipartite sets of G and let

$S = V(G) - \{x, y\}$, where $x \in X$ and $y \in Y$. Then S is a $Ddim$-set of G so that $Ddim(G) = r + s - 2$. Since x and y are arbitrary, S is not an unique $Ddim$-set of G containing x and y, $f_{Ddim}(S) = r + s - 2$. Since this is true for all $Ddim$-sets S of G, we have $f_{Ddim}(G) = r + s - 2$.

Theorem 2.8. For the graph $G = K_n - \{e\}$, $n \geq 4$, f_{Ddim}

$(G) = \{ 2 \quad if\ n = 4$

$n - 1 \quad if\ n \geq 5$

Proof: Let V(K_n) = $\{v_1, v_2, v_3,..., v_n\}$ and let $e = v_1v_2$. First assume that $n = 4$. Then $S_1 = \{v_1, v_3\}$,

$S_2 = \{v_2, v_3\}$, $S_3 = \{v_2, v_4\}$, $S_4 = \{v_1, v_4\}$ are the only four $Ddim$-set of G such that $f_{Ddim}(S_i) = 2$ for $i = 1$ to 4 so that $f_{Ddim}(G) = 2$. So let $n \geq 5$. Then G is Hamiltonian connected. By theorem $S = V(G) - \{x\}$, where $x \in X$ is a $Ddim$-set of G so that $Ddim(G) = n - 1$. Since x is arbitrary,S is not an unique

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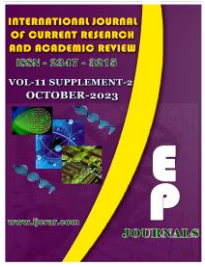

$Ddim$-set of G containing x, $f_{Ddim}(S) = n - 1$. Since this is true for all $Ddim$-sets S of G, we have $f_{Ddim}(G) = n - 1$.

Theorem 2.9. For the wheel graph $G = W_n$, $n \geq 3$, $f_{Ddim}(W_n) = n - 1$.

Proof: Let $S = V(G) - \{x\}$, $x \in V(G)$. Then S is a $Ddim$-set of G so that $Ddim(G) = n - 1$. Since x is arbitrary, S is not an unique $Ddim$-set of G containing x, $f_{Ddim}(S) = n - 1$. Since this is true for all $Ddim$- sets S of G, we have $f_{Ddim}(W_n) = n - 1$..

Theorem 2.10. For the crown graph $G = H_{n,n}$, $n \geq 4$, $f_{Ddim}(H_{n,n}) = 2n - 2$.

Proof: Let $V(G) = \{u_1, u_2, \ldots, u_n, v_1, v_2, \ldots, v_n\}$, $E(G) = \{(u_i, v_j); 1 \leq i, j \leq n; i \neq j\}$, X=$\{u_1, u_2, \ldots, u_n\}$ and Y=$\{v_1, v_2, \ldots, v_n\}$

Let $S = \{u_1, u_2, \ldots u_{n-1}, v_1, v_2, \ldots, v_{n-1}\}$. Then the detour representations of (2n-2) tuples are as follows

$Dr(u_1/S) = (0,2n-2,2n-2, \ldots,2n-2,2n-1,2n-1, \ldots,2n-1)$
$Dr(u_2/S) = (2n-2,0,2n-2, \ldots,2n-2,2n-1,2n-1, \ldots,2n-1)$
$Dr(u_3/S) = (2n-2,2n-2,0,2n-2, \ldots,2n-2,2n-1,2n-1, \ldots,2n-1)$
$Dr(u_{n-1}/S) = (2n-2,2n-2, \ldots 2n-2,0,2n-2,2n-1,2n-1, \ldots,2n-1)$
$Dr(u_n/S) = (2n-2,2n-2, \ldots,2n-2,2n-2,2n-1,2n-1, \ldots,2n-1)$
$Dr(v_1/S) = (2n-1,2n-1,2n-1, \ldots,2n-1,0,2n-2, \ldots,2n-2,)$
$Dr(v_2/S) = (2n-1,2n-1,2n-1, \ldots,2n-1,2n-2,0,2n-2, \ldots,2n-2,)$
$Dr(v_3/S) = (2n-1,2n-1,2n-1, \ldots,2n-1,2n-2,2n-2,0,2n-2, \ldots 2n-2)$
$Dr(v_{n-1}/S) = (2n-1,2n-1,2n-1, \ldots,2n-1,2n-2,2n-2, \ldots,2n-2,0,2n-2)$
$Dr(v_n/S) = (2n-1,2n-1,2n-1, \ldots,2n-1,2n-2,2n-2, \ldots,2n-2)$

Since the representation are distinct, S is a $Ddim$-set of G so that $Ddim(G) \leq 2n - 2$. We demonstrate that

$Ddim(G) = 2n - 2$.Consider however, that $Ddim(G) \leq 2n - 3$.If so, a circular resolving set S' exists such that $|S'| \leq 2n - 3$. As a result, there are at least two vertices, $u, v \in V \backslash S'$such that $cr(u/S') =$

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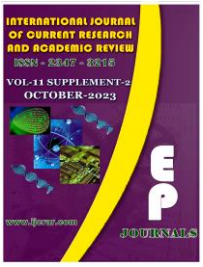

$cr(v/S') = (2n-1, 2n-1, \ldots, 2n-1, 2n-2, 2n-2, \ldots, 2n-2)$ or $(2n-2, 2n-2, \ldots, 2n-2, 2n-1, 2n-1, \ldots, 2n-1)$ which is incoherent. As a result, $Ddim(G) = 2n-2$. Let $W = V(G) - \{x, y\}$, where $x \in X$ and $y \in Y$. Then W is a $Ddim$-set of G so that $Ddim(G) = 2n-2$. Since x and y are arbitrary, W is not an unique $Ddim$-set of G containing x and y, $f_{Ddim}(W) = 2n-2$. Since this is true for all $Ddim$-sets W of G, we have $f_{Ddim}(G) = 2n-2$.

Theorem 2.11. Let G be the middle graph of the path $P_n (n \geq 3)$. Then $f_{Ddim}(G) = 0$.

Proof. Let $V(P_n) = \{v_1, v_2, \ldots, v_n\}$ and $u_i = v_i v_{i+1}$, $1 \leq i \leq n-1$. Then $V(G) = \{v_i, u_j, \}(1 \leq i \leq n, 1 \leq j \leq n-1)$. In G, v_i is adjacent to u_1, v_n is adjacent to u_{n-1}. v_i is adjacent to u_{i-1}, u_i, $2 \leq i \leq n-1$, u_1 is adjacent to v_1, v_2 and u_2, u_i is adjacent to u_{i-1}, u_{i+1}, v_i and v_{i+1} for $2 \leq i \leq n-2$ and u_{n-1} is adjacent to $v_{n-2}v_{n-1}$ and v_n.

Evidently, $|V(G)| = 2n-1$. As a result of $G \neq P_n$, then $Ddim(G) \geq 2$.Let $W = \{v_1, v_n\}$,

$Dr(v_1/W) = (0, 2n-2)$, $Dr(v_2/W) = (3, 2n-3)$, $Dr(v_3/W) = (5, 2n-5)$, …, $Dr(v_{n-2}/W) = (2n-5, 5)$, $Dr(vn-1/W) = (2n-3, 5)$ $Dr(vn/W) = (2n-2, 0)$, $Dr(u1/W) = (1, 2n-3)$, $Dr(u_2/W) = (3, 2n-5)$, $Dr(u_3/W) = (5, 2n-7)$,..., $Dr(u_{n-2}/W) = (2n-5, 3)$, $Dr(u_{n-1}/W) = (2n-3, 1)$. W is a detour resolving set of G, and since the detour metric representation is distinct, $Ddim(G) = 2$. Also since W is the unique detour resolving set of G, $f_{Ddim}(G) = 0$.

Conclusion

This article established a novel distance metric called the forcing detour metric dimension of a graph. We will develop this concept to incorporate more distance considerations in a subsequent investigation.

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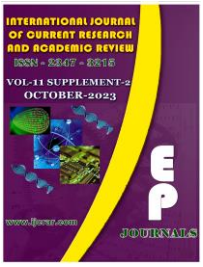

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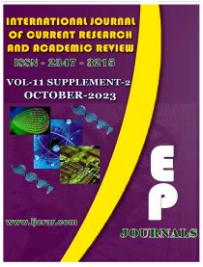

Full Length Article **IJCRAR/FL/04**

Biological Treatment of Synthetic Oil field using Microbial Consortium

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Abstract

Environmental pollution, particularly contamination of soil and water by hydrocarbons derived from oil-related activities, has emerged as one of the most pressing global concerns. These pollutants are inadvertently released into the environment during processes spanning industrial activities, extraction, refinement, transportation, consumption, and various other human endeavors, making their presence nearly ubiquitous. Microscopic life forms have remarkable capability to reduce hydrocarbon pollutant levels in the environment to safe and more environmentally benign levels. The process is termed as Bioremediation and It at its core, involves the utilization of living organisms, primarily microorganisms, to catalyze the degradation of environmental contaminants, specifically hydrocarbons derived from oil. While bioremediation holds immense promise for addressing complex environmental issues, there is still much to uncover about the interactions between microorganisms and different hydrologic environments. As our understanding of these processes deepens, the efficiency and applicability of bioremediation will undoubtedly increase.The study revealed that the microbial consortium exhibited optimal growth within a span of 2-3 days. Enumeration of bacterial populations was conducted in industrial oil effluent samples. Notably, a substantial increase in all tested parameters was observed in the industrial effluent compared to normal values. Oil was chosen as the target pollutant, encompassing known samples (Petrol, 2T oil, Diesel, and cooking Oil) and unknown samples (Auto worker hand wash, Engine cleaning oil, Bike water wash). Microbial growth thrived with increasing oil concentrations. In conclusion, this study demonstrates the versatility of bioremediation, applicable to a wide range of organic and inorganic compounds, both in-situ and ex-situ. Bioremediation emerges as an innovative, cost-effective, and environmentally friendly alternative to conventional cleanup methods. This research underscores the potential of microbial consortia and microalgae in advancing bioremediation techniques, highlighting the need for continued exploration and innovation in this critical field of environmental science.

Keywords: Bioremediation, Hydro carbon Bioremediation, Microalgae in Bioremediation.

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Journal home page: http://www.ijcrar.com

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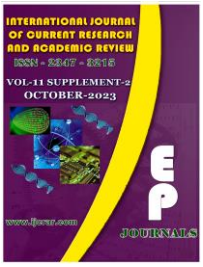

Introduction

Environment pollution is the most important Problem reported globally. Contamination of soil and water by hydrocarbon from oil accidentally enter the environment and the development of agriculture and manufacturing industries has resulted in increased release of a wide range of xenobiotic compounds to the environment from, processes industry, extraction, refinement, transport, consumption and many activities has become inevitable. The presence of crude oil degrading microbes is expected to reduce levels of pollutant up to safe level. Bioremediation is, use of living organisms, primarily microorganisms to degrade the environmental contaminant into less toxic level. Individual microorganisms can metabolize only limited range of hydrocarbon substrates, so assemblages of mixed population with overall broad enzymatic capacities are required to bring the rate and extent of biodegradation efficiently. It is the most effective management tool to manage the polluted environment. This technology relies on promoting the growth of specific micro flora or microbial consortia that are indigenous to the contaminated site that are able to perform desired activities. Microbes are very helpful to remediate the contaminated environment. The Important hydrocarbon degrading strain microbes are of genus Bacillus, Pseudomonas, Nocardia, Micrococcus, Candida, Aspergillus sp., Penicillium sp., Have been frequently isolated from environment. Many microbial strains, each capable of degrading a specific compound, are available commercially for bioremediation. Microorganisms can be isolated from almost any environmental conditions. Microbes will adapt and grow at sub-zero temperatures, as well as extreme heat, dessert conditions, in water, with an excess of oxygen, and in anaerobic conditions, with the presence of hazardous compounds or on any waste stream. The main requirements are an energy source and a carbon source. Because of the adaptability of microbes and other biological systems, these can be used to degrade or remediate environmental hazard.

Materials Required

Sample

a) Soil amended with oil, b) Oil contaminated water (wash water, kitchen waste), c) Oil contaminated solid waste (onion peel). For Microbial Isolation

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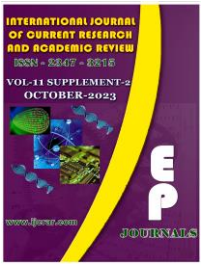

Known sample: Petrol(Os1), 2TOil(Os2), Diesel(Os3), cooking oil(Os4).

Unknown sample: Auto workers hand-wash (S1), Engine cleaning oil(S2), Bike water wash(S3).

Media

Tri butyrin agar, SDA, BG11 medium.

Broth

Nutrient broth (bacteria), Blue Green 11 broth (algae), potato dextrose broth (fungi).

Methodology

Isolation and Preparation of Inoculum

Isolation of Bacteria from Oil Contaminated Soil

Isolation of bacteria was done by screening for lipase producers.1g of soil sample was dissolved in 10ml of sterile saline, this master dilution was serial diluted to 10^{-2},10^{-3},10^{-4},10^{-5},10^{-6},10^{-7},10^{-8} Tri butyrin agar was prepared and dilutions of 10^{-6}, 10^{-7}, 10^{-8} were plated to screen lipase producers, by incubating at 37^{o}C overnight. The pH of the prepared medium was set at 7.2.

Isolation of Fungi from Oil Contaminated Onion Peel

Oil contaminated onion peel was spread with the help of sterile forceps PDA with tributyrin and incubated under room temperature for 3days.The pH of prepared medium was set at 5.After 3 day of incubation the plates were observed for with a clear zone of lipolysis.

Isolation of Algae from Algal Biofilm of Boat

Isolation of algae was done from samples collected as biofilms on the surface of boat. The biofilm was transferred in sterile BG11 medium with added tributyrin and incubated at 28^{o}c under 12 hour light/dark cycle for a period of 15-20 days.

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International Journal of Current Research and Academic Review

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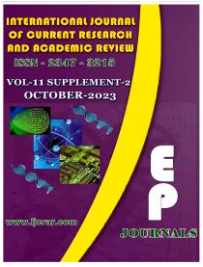

Oil Degradation/ Bioremediation (Control/Known Samples)

Oil used as control (Petrol os1, 2toil os2, Diesel os3, Cooking oil os4). To 9ml of sterile distilled water in test tubes added 1ml of known sample, and 0.5 ml of culture – bacteria, fungi, and algae and also in mixed form. The tubes were incubated at the room temperature for around a month.

Oil Degradation/ Bioremediation (Unknown Sample)

To 9ml of sterile distilled water in test tubes added 1ml of known sample, and 0.5 ml of culture – Bacteria, Fungi, and Algae and also in mixed form. The tubes were incubated at the room temperature for around a month.

Preliminary Tests for the Bioremediated Samples

Test for Determination Oil and Grease in the Sample, After Bioremediation

To determine oil and grease, samples were collected in separate bottles. 50µl of the sample was transfer to tube.5µl of 1% ferric chloride solution was added to the tube with vigorous mixing. 5% sodium carbonate was added immediately drops till the suspended particulates agglomerate to from flock drops. A waiting time of 10 minutes was allowed. The effluent was observed for the precipitate, the supernatant was discarded carefully. 5µl of diluted hydrochloric acid was poured into the beaker and dissolved in the precipitate. The extracted aqueous layer using petroleum ether was added to 2g of sodium sulphate and stir rod. Left undisturbed for 30 minutes. After the 30 minutes content were filtered through Wattman filter paper, and filtrate was collected and weighed

Tests for Biosurfactants

Oil Spreading Method

In oil spreading method if bio surfactant is present in the supernatant, the oil is displaced and a clearing zone is formed.30 ml of distilled water and 5micro liter of crude oil added to petri-plate with 5 micro liter of culture was added to petri- plate (Table 1)

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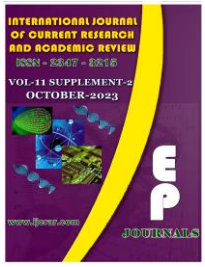

Drop Collapse Method

In drop collapse method, drops of a cell suspension or of culture supernatant placed on an oil coated, solid surface.2ml of crude oil, and 5µl of the culture supernatant was added to the surface of the oil and the shape of drop on the oil surface was observed after 1 min.(Table 2)

Characteristic of Bio Surfactant

Ninhydrin Test

The ninhydrin test is a chemical test which is used to check whether a given analyte contains amines or α-amino acid. Exactly 1ml extracted solution in 2.5culture was added to the tube, and 3 drops of 0.5% Ninhydrin solution was added. The tube was Kept in boiling water bath for minutes, to observe the change of color of the reaction mixture.(Table 3)

GC – MS - Oil Degradation/ Bioremediation Samples

Absence of peaks at 226 is clearly ensured. Absence of hexadecane or Dodecanese indicates cleaved products of 2T-oil which are common pollutants of vesicles in the environment. The use of consortium with (Bacteria, Fungi and Algae) microbes has served as a best tool in this bioremediation where else the compound will exist as hexadecane or Dodecanese pollutants. Peaks around 55- 60 and 47 shows the presence of methyl compounds specifically, dimethyl compounds which are degrade compounds of 2T-oil which could have been possible by a co-metabolic process in presence of benzene & toluene formed.

Table.1 Oil Spreading Test

Sample	Diameter of Oil Spread Zone	Inference
IS 1	Clear zone of 1 – 2cm	Positive
IS 2	Clear zone of 1.6-2.5cm	Positive
IS 3	No oil spreading activity	Negative
IS-4	Clear zone of 0.5-1.5cm	Positive
Control	No oil spreading activity	Negative

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Table.2 Emulsification Index

Known Sample	Emulsification Index (ml)
Os1	30
Os2	20
Os3	10
Os4	20
Unknown Sample	
S1	20
S2	50
S3	30

Table.3 Ninhydrin Test

Ninhydrin test	Colour change	Inference
Known sample		
Os1	Dark brown	Positive
Os2	Dark brown	Positive
Os3	Dark brown	Positive
Os4	Dark brown	Positive
Unknown Sample		
S1	Dark brown	Positive
S2	Brown color	Positive
S3	Light reddish brown	Positive
Control	No color change	Negative

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Table.4 TDS – Oil Degradation/ Bioremediation Samples

Known Sample	TDS before treatment	TDS after treatment
Os1	302	73
Os2	282	279
Os3	338	192
Os4	582	560
Unknown Sample		
S1	420	209
S2	206	56
S3	430	205

Valtrate is an unstable compound and is non-toxic. Presence of mass peak at 422 indicates valtrates in the degrade residue which also serve as surfactants & emulsifier that facilitates degradation process further. Peaks at 366 indicates octadcane / 3 ethyl-5(2-ethyl butyl) compound which are straight chain alkane of 18C atoms & has a role as bacterial and algal metabolites.

Inferences

Indigenous microbial population shows good bio remediating property. Consortium treatment seems to be effective compared to individual isolate tested during this study. This was evident from IS – 3 fungal isolate which showed negligible degradation effect initially as a individual degrader and active participant in the of microbial population. Degradation of Engine cleaning oil would have been initiated by oxidation of methyl group according to GC–MS results and this was contributed mainly by the fungal partner of the consortium. The treated effluent of Engine cleaning oil is very much safe to the environment as inferred by GC – MS results.

Conclusion

Bioremediation provides a technique for cleaning up pollution by enhancing the natural biodegradation processes. So by developing an understanding of microbial communities and their response to the natural environment and pollutants, expanding the knowledge of the

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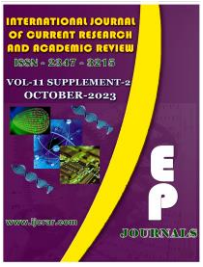

genetics of the microbes to increase capabilities to degrade pollutants. Conducting field trials of new bioremediation techniques which are cost effective, and dedicating sites which are set aside for long term research purpose, these oppourtinities offer potential for significant advances.

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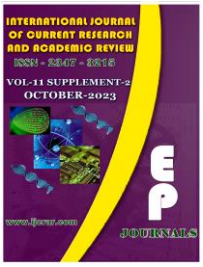

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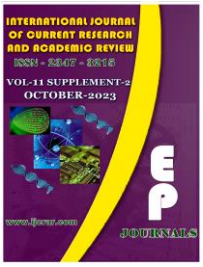

Full Length Article **IJCRAR/FL/05**

A Novel Deep Learning Architecture for Participant Prediction in Online Social Events

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Abstract

Participant Prediction for the event based online Social networks has stepped up significantly during pandemic period for conducting the online events. It is considered as more challenging for the event organizer to identify the appropriate participant for their online events. Hence in order to automate the process of the participant prediction for online social events, machine learning algorithm has been projected as existing solutions. Despite of more benefits, solutions for participant prediction suffers in various aspects like data sparsity and cure of dimensionality issues. In this article, a Deep connect, a deep learning model for identifying the participant on basis of the Dynamic Multi-preference of the user on their Multidimensional Attributes has been proposed. Multi-preference has been incorporated to reduce the data sparsity issue and user communication information is enabled to eliminate the cold start complications. Furthermore predictions list with huge diversity has been managed using the long term and short term interest model of the user. The present technique incorporates the explicit user attribute and implicit user attribute to determine the possibility of the user of attaining the event with computing the stability between exploitation and exploration. Finally participant recommendations to the event are generated using RNN algorithm on various adaptive inference strategies as deep learning architecture to handle the weight and ranking of the user on multiple perspectives. The experimental results on various settings using meetup dataset demonstrate the performance of the proposed model outperforms the existing state of art models on predicting the participant for social events with respect to the performance measures such as accuracy and efficiency.

Keywords: Recommendation System, Event based Social Networks, user preference learning, Participant Prediction Multi-preference.

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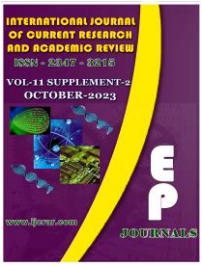

Introduction

Event based Social Networks (ESBN) have been extensively growing to provide personalized platform for data sharing to the users about their contents from a large volume of choices with high quality [1]. The computation of user's preference to the particular event is advantageous for regulating or approximating their future conclusions.

Conventional machine learning methods for participant prediction has been implemented using unsupervised classification of the user profiles of the social network. User profiles can be demonstrated in form of user interests, unique characteristics and varied preferences [2].

Despite the extensive studies of recommendation system using machine learning [4][5], collaborative filtering has been employed as conventional techniques to compute the user expectation using user event matrix composed of the entire user ratings. Nevertheless presumption is impractical in the present circumstances as size of social data expanding will be cumbersome on controlling entire data using the machine learning models.

In addition, Term frequency and inverse document frequency employed to map the user to event effectively. Hence deep learning model on incorporating the user preference will lead to better results on managing the data with content and time drift. Further deep learning model is capable of handling the challenges of the curse of dimensionality and data sparsity.

In this paper, Deep Connect using user's multi-preference has been obtained with respect to multidimensional attributes has been designed and implemented. Through projection of multi-preferences in the deep learning, user's multidimensional attributes will easily extracted simultaneously to alleviate the sparsity and cold start issues using similarity computation.

User interest learned from the user preference on explicit and implicit attribute of the items. It maps the user to the events on exploring the interest and linguistic variables of the context. Finally it captures the user dynamic user preference on the explicit contextual features with respect to the rating of past interest of the user.

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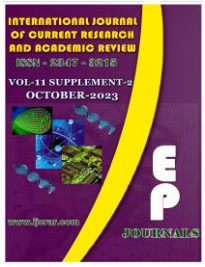

The remainder of the article is divided into the following sections: Section 2 covers the various works of literature pertaining to prediction concepts. The Deep Connect Approach, which recommends taking into account a user's multiple preferences based on different profile attributes, should be expressly developed in section 3. The full analysis of the suggested strategy is then presented in Section 4 through experimental comparisons with existing approaches. The last section of the proposed work, Section 5, serves as its conclusion.

Related Work

There exist conventional techniques employed to identify the user prediction to online social events has been analysed on various criteria's and perspectives efficiently along the various impacts investigations with different objectives on learning models. It is as demonstrated as

Fast Tensor Factorization for Event recommendation

In this literature, Fast Tensor Factorization approach has been employed for the participant prediction through implicit feedback information of the user. In addition, the event has been analysed for event aware recommendation. In this covariance and correlation of the user and should be estimated for the given context using matrix computation [11]. Additionally indistinct data of the user –event recommendation should be formulated on the basis of the association between the contexts. It has been mutually strengthened using chain reaction and facilitating the information of the event logs and user profiles of the event participants. Finally it constructs the user neighbourhood for each individual user on basis of user rating matrix and social relations of the users to the recent events with predicted rating on various explorations.

Evolving user behaviour classification for participant prediction approach

This literature utilizes the enhancing iterative learning algorithms to generate and filter the participant prediction approach at various data points of the user in the varied time slot on multiple characteristics of the event. In variance to the conventional recommendation techniques using machine learning, it executes in a batch mode on account of bagging procedure to user-event matrix. It is extremely proficient in altering a user-event traditional hypothesis on similarity

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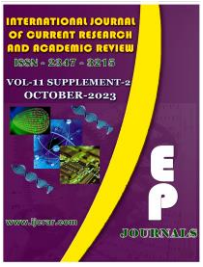

estimation to build a current user item hypothesis on specified time [6]. It computes the denser communities using two stage frameworks in the network structure on considering the dynamic social effects within the users. The phenomena validates the decision making process of the social influence based thresholds. It identifies the close relation and similar preference of the user on the popular social events. A further social phenomenon to the temporal events has been calculated.

Identification of options using Conflict for Social Event Participation

In this literature, Conflict option based approach has been reconstructed towards decision-making process to the users enabled with multiple conflicts. In this perspective, the inclusion of choice utility model has been formulated on the users' tendency with integrating event content, social content along the cost-based personnel and technical factors. On those computations, it derives the topic interests as well as latent social user interactions could be both gathered. Furthermore, the choice of conflict-choice triples into the pair wise ranking task has been transferred, and a learning-to-rank based optimization scheme is incorporated to mitigate the conflict issue of the recommendation system [11]. It coverage's the discriminant results on the gradients of the global convergences.

Event Recommendation based Context-Aware Collaborative Filtering to ESBN

In this literature, event-based social networks have been provided a user specific platform for hiring a participant to the event using online web applications. This model provides the high accuracy on participant recommendation. A semantic enhanced evolving context aware dual collaborative filtering for event recommendation to evolving events provides reliable solution on integrating semantic content analysis process and contextual event influence analysis process to compute the user neighborhood to the event selection.

In particular, the latent topic model on the various topics has been analyzing against multiple event description text and established a user long-term and short terms interest model to alleviate the issue in the model. Further it establishes influence weight computation for each event to determine the social impact among users and its semantic uniqueness among events. Finally it identifies the neighbour for the user according to their long term interest similarities weighted by

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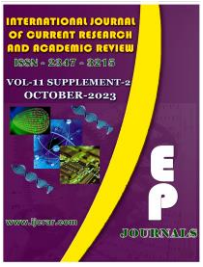

events' influences. It also identifies new event recommendation on a user-event rating matrix based on event rating prediction on the users' short-term interest models and neighbours' ratings has been determined.

Social diffusion analysis for annotating media contents

In this literature, media annotating approach has been employed to the events on basis of determining the social diffusion records instead of metadata. In this model, primary assumption is that the social diffusion records reflect the common interests (CI) between users to the exploring events of the social network, which can be analyzed for generating annotations to the events to compute the effective and stable participant effectively.

With this assumption, Content Inference -based social diffusion model and translate the automatic annotating task into the Content Inference-based diffusion maximization (CIDM) challenges. Moreover, two optimization tasks has been analysed to handle the prediction challenges, corresponding to the training and test stages in supervised learning model of the participant prediction to achieve the high discriminant results to the user influences.

Proposed Model

In this section, Deep Connect based participant prediction for online event Recommendation on adaptive inference strategies has been computed to evolving characteristics of the user. The process of the architecture is represented as follows

Missing value Imputation

Missing value Imputation procedure is employed to fill the missing value in the meetup dataset. In this work, missing values imputed using the K-NN algorithm. The model is processed by generating the user- event matrix to define the uncertainty of practicable values which ought to be assigned on missed attribute fields. The n times values then analyzed to obtain single integrated estimates using definite fitness criteria [12].

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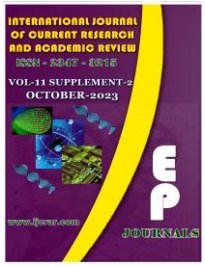

To formulate the dependence of the value to the attribute, the classic Independent Cascade (IC) approach has been simulated for simulating the dynamic mutual influence within users.
Context aware influence weight to represent its implicit impact on users' social relations has been processed in this part. Initial connections between the users might be extremely sparse to the event.

However, after the first attendance, the social factors of the user will be improved due to string connection within active users participating the more social events with respect to both the degree and influence weight rapidly. Particularly, the degree of the user will remain stable, and then decreases slowly due to evolving characteristics, while the event weight still keeps incrementing.

Especially in some case user leaves the event and retaining those connection becomes stronger due to more co-occurrences of the user participation. Hence, long-term active users hold denser communities than ordinary ones, which definitely mean more significant social effects. It can be formulated using cost functions.

Feature extraction of the user characteristics

The feature of the user for the event is defined in type of User –event rating matrix this it is to calculate the association among users and event. User Weight connection has been computed on social influence of the user. Each cell of the user-event matrix can be constituted as a triple data set in the network structure of

$H=\{U_i, E_j, R^j\}$

Where U_i which defines a user's preferences and R^j represents a user latest preference to the event E_j. Additionally it concludes that user interest of specific event is determined by the explicit and implicit attributes of user and event collaboratively. Computation of the user discrimination errors lead to higher cost of the participant prediction and to reduce the implication, cost function may be formulated to result in the optimized inference of users' profiles and social strength by step by step iterative approach.

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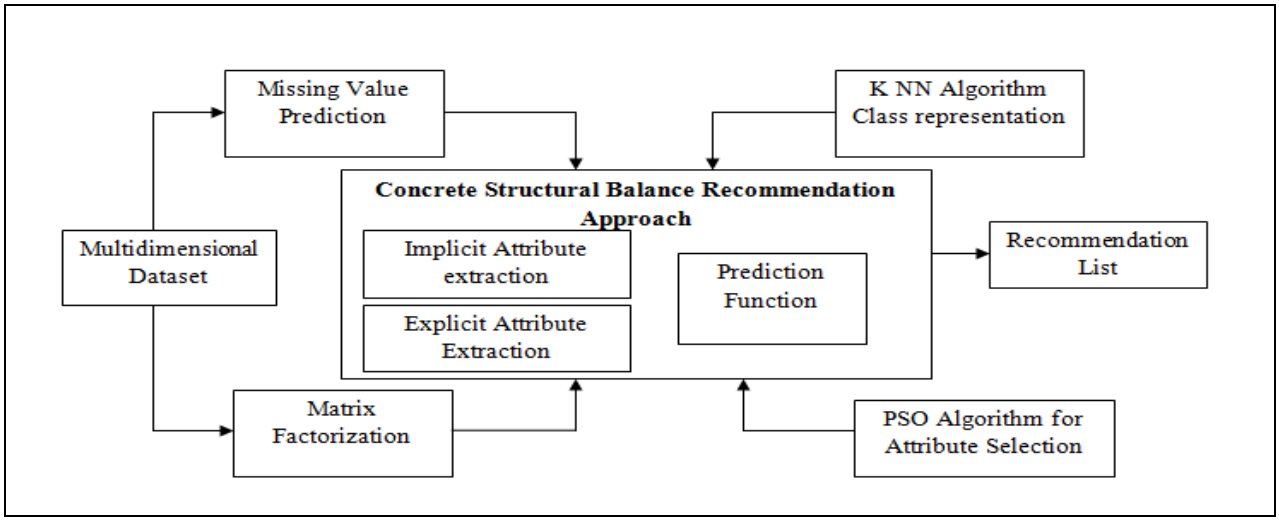
Fig.1 Proposed Architecture



User preference based on Implicit and Explicit attributes

The main procedure of a participant prediction model is to establish a group on extraction of the user's preferences and determining the degree of dissimilarity of event to its selected user group in the online social network. Preference elicitation approaches are to represent the recommendation of the event in this scenario by producing the hypothesis of user preferential independence of the description of the event. Cluster builds on account of rating matrix thus it outcomes the event on the interaction among users and event [15].

In this research, matrix factorization is used mostly for implicit attribute extraction of the user for the particular event. Let U^I& E^I defines the implicit attributes space to contain users and event respectively. Furthermore

Vector $U^I = \{w_{i1}, w_{i2}, w_{i3...} w_{in}\}$

Vector $EI = \{e_{i1}, e_{i2}, e_{i3....}e_{in}\}$

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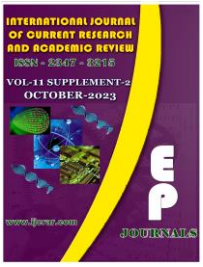

Above definition, produces the user and event implicit attributes weights vector to build the prediction function for participant estimation. User profiles and their social connections are inferred in the training stage. In test stage, predicting the user participation for the target event has been computed.

Class Representation

Features set representation should be defined through relationship of user and event using the Recurrent Neural Network [9]. Deep learning model is capable of the process the feature generated. The LSTM Model stores the feature set and process the feature on hidden relationships as a vector that determines the events the users prefers with homogenous dimension labels. Accordingly the comparable degree among users to the specific event can be computed on employing dimension similarities on the sigmoid based activation function of the RNN Model.

Algorithm 1: Item recommendation

Input: Event profile and User Profiles

Output: Participant Prediction to the events recommendation

Process

Compute Implicit and explicit dimensions of the user

Establish the user-event matrix using matrix factorization

For U =1,2,3,4...i

Determine User Vector V← Event arg_{min} |w|

Activate function $W\gamma_{+1} = (1-\gamma^{-a})w_{\gamma} + E_{arg}$

Return user elicitation event Matrix

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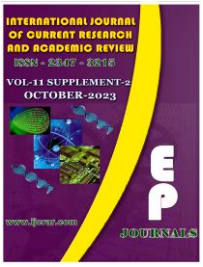

In above algorithm, Participant prediction to the events has been computed on the basis of the specified association on the implicit and explicit attributes.

Specifically, proposed approach achieves the better performance with significant margin indicates that the dynamic social influence indeed affects the event participation. Furthermore, the results are stable as variance for multiple user among the multiple event is quite small, which proves the robustness of our framework to a certain degree.

Experimental Results

In this part, experimental outcomes of the proposed approach has been implemented and evaluated against the conventional machine learning recommendation models to illustrate that proposed approach performs better compared with conventional approaches with respect to precision, recall, f-measure and execution time on the meetup dataset.

Dataset Description

Extensive experiments have been accomplished using meetup dataset. Meetup is extensively employed for event recommendation tasks. Dataset contains 100,000 instances with various events for different varieties. The dataset which reconstructed into matrix form has been employed for remaining analysis on the latent preference of the user and event cost analysis using multiple influences.

Evaluation

The proposed architecture is evaluated against the following performance metrics such as Precision (P), Recall(R) and F measure (F).

Precision

The precision value is the ratio of similar data point to the extracted data point from the data space. Precision is also considered as number of reliable feature split by the amount of all

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extracted feature from the data space. The evaluation is assessed using multiple dataset is represented in the figure 2.

$$\text{Precision} = \frac{\text{True positive}}{\textit{True positive+False Positive}} = \frac{TP}{TP+FP}$$

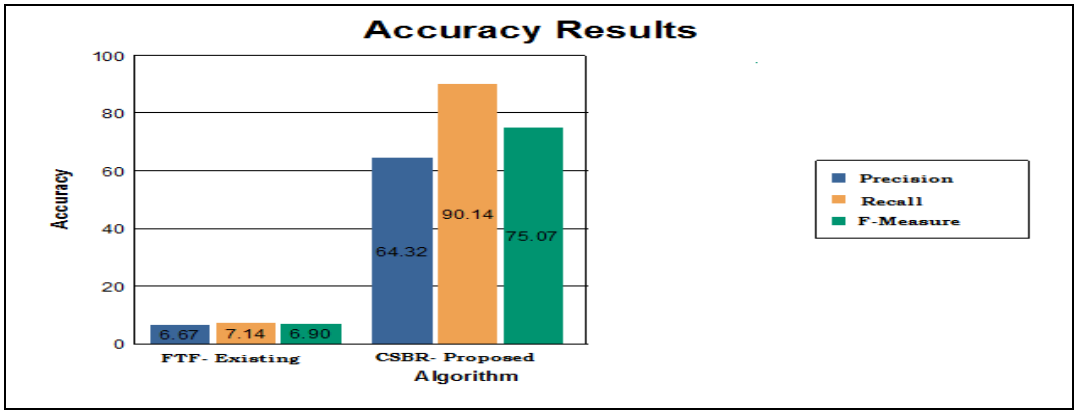
Recall

It is the ratio of similar data point of the data to the retrieved instance over the total number of similar data point in the dataset. The recall is the chunk of the similar occurrence of features which are accurately classified into the exact classes.

$$\text{Recall} = \frac{\text{Tp"True positive "}}{TP\text{"True positive"}+FN\text{"False negative"}}$$

On recall performance analysis, the time depend similarity among events in the social networking discussions can represent a user preference on predicting the hidden pattern and preference in the neural network.

Fig.2 Performance computation of prediction accuracy



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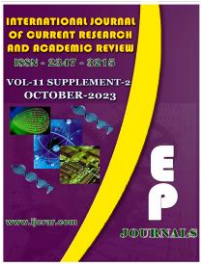

F Measure

It is a metric employed to compute a model accuracy of the recommendation result and is measured as the weighted harmonic mean of the precision and recall of the training or test data. According to the results, proposed performance degenerates with less user training samples, which indicates that the framework is sensitive social network structure. Besides, the high ratio of freshmen leads to the severe "cold-start" problem, which impacts the result severely

Based on the analysis, preference-sensitive social connections are proven as insufficient to support the decisions making towards participant prediction to the event. Besides, the cold-start problem, which leads to sparse social network and interaction records, may further hurt the performance. Those complications have been tackled using interest model on the implicit and explicit attributes of the model.

The performance of the execution time of the proposed model is computed against state art approach is represented in figure 3 and assessed values of the evaluated data has represented in Table 1 on recommendation system.

Table.1 Performance Comparison of Proposed Methodology Against Measures for Meetup Dataset

Dataset	Technique	Precision %	Recall %	Fmeasure %
Meetup dataset	Proposed Solution	97.37	86.23	97.23
	Existing Solution	81.61	72.23	85.26

As represented in Table 1, proposed approaches evolves the complete participant prediction process on meetup dataset will run 3-4 orders of magnitude speed on comparing against the conventional approaches.

Specifically, we utilize the sigmoid function to the RNN architecture to approximate the sign function varying from 0 to 1 participant prediction results containing users. Thus a higher

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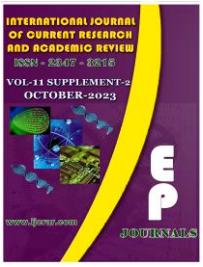

influence weight might be better for user prediction approximation using the activation function. However, smooth variation is will achieved in the softmax layers especially for vectors containing the interest model.

Conclusion

We designed and implemented the Deep Connect a participant prediction system for the event based social networks for various social events. The model predicts the participants to the events on basis of user preference from a series of event in user event matrix on incorporating explicit and implicit dimention of events. The explicit user attribute-based prediction induces the preference approach in relation to designing the user multipreferences which has ability to reduce the sparsity and cold-start issues. Furthermore proposed model uses the Recurrent Neural Network which has potential to build a large diverse recommendation index than conventional prediction systems by determine the participant on the feature extracted on multiple perspectives. Experimental results has been proven to highly stable and accurate to large scale networks containing large data sources and complex user characteristics on the user profiles to the social network.

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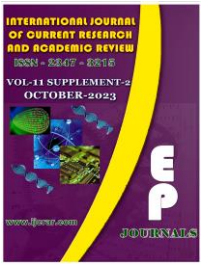

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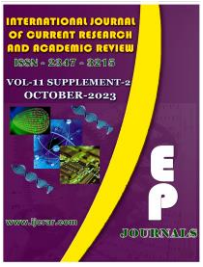

Full Length Article **IJCRAR/FL/06**

Algorithmic and Logical Characterizations of Data Mapping

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Abstract

Technologies for overcoming heterogeneities between autonomous data sources are key in the emerging networked world. Our doctoral research investigates technologies for alleviating structural heterogeneity between relational data sources. At the heart of structural heterogeneity is the data mapping problem. The data mapping problem is to discover effective mappings between structured data sources. These mappings are the basic "glue" for facilitating large-scale adhoc information sharing between autonomous peers in a dynamic environment. Automating their discovery is one of the fundamental unsolved challenges for data interoperability. Our research on solutions to the data mapping problem has two main components: (1) a general algorithmic approach to automating the discovery of mappings and (2) a general formal approach to understanding the data mapping problem. We outline our progress on each of these fronts and discuss directions for future research.

Keywords: autonomous data sources, databases, structural heterogeneity, system level.

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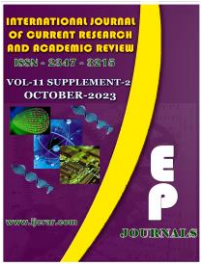

Introduction

The emerging networked world promises new opportunities and possibilities for information dissemination, wide- scale collaboration, and knowledge construction. These opportunities will be fostered in large part by technologies which bring together autonomous data sources. Since these data sources were created and have evolved in isolation, they are each maintained differently according to local constraints and usage patterns. Consequently, facilitating technologies must bridge a wide variety of heterogeneities. These heterogeneities encompass differences at the system level, differences in the structuring of data, and semantic pluralism in the interpretation of data.

We are investigating technologies for overcoming structural heterogeneity between relational data sources. Al- though research in databases has lead to great practical successes in the storage and management of structured data, it has made limited progress on technologies for alleviating structural heterogeneity. At the heart of overcoming structural heterogeneity is the *data mapping problem*: automating the discovery of mappings between structured data sources [4].

These mappings are the basic "glue" for building information sharing systems [7], and automating their discovery is one of the fundamental unsolved challenges for data interoperability, integration, and sharing. This problem arises in almost any information system with multiple data sources. Consequently, the problem has many manifestations: schema matching [16] and schema mapping [15] in databases, ontology mapping on the Semantic Web [10], schema mediation in peer-to-peer systems [7], and matching of information models [14], to name a few.

Example 1

To illustrate the data mapping problem, consider the three databases containing student grade information in Figure 1. In this example, each database contains the same information. As shown, there are many natural ways to organize even the simplest datasets. For example, G1 and G2 maintain the information in a single relation, while G3 contains a relation for each assignment. To move between these representations of student data, schema matchings and both data-data and

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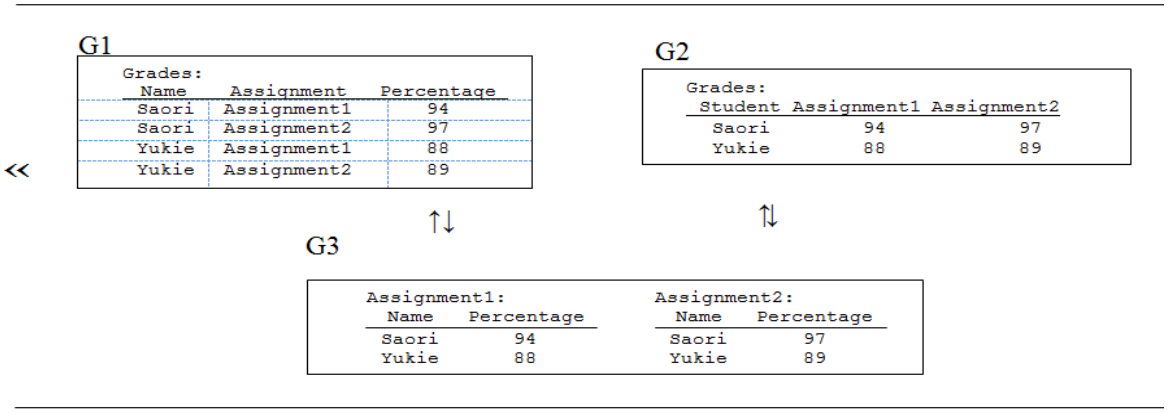
data-metadata transformations must be performed. For example, mapping data from G1 to G2 involves promoting the values in column Assignment in G1 to column names in G2 and "matching" the Name and Student attributes. To move information from G3 to G1, relation names must be demoted to data values.

Any solution for overcoming structural heterogeneity must consider the full data mapping problem space for relational data sources. Both schema matchings ("traditional" metadata-metadata mappings between schema elements [16]) and data-metadata mappings (where data elements in one structure serve as metadata components in the other, or vice versa [12]) must be expressible. It is important to note that consideration of the full mapping space blurs the distinction between schema matching and schema mapping, since data-metadata mapping encompasses schema matching as a special case. When metadata itself is seen as data, both schema matching and schema mapping are encompassed in *data mapping*.

Our investigation of the data mapping problem is part of the *Modular Integration of Queryable Information Sources*

Fig.1 Mappings between student grade representations.



(MIQIS) project at Indiana University [19], a formal frame- work for data interoperability on the Semantic Web and in peer-to-peer data management systems. Among the distinguishing features

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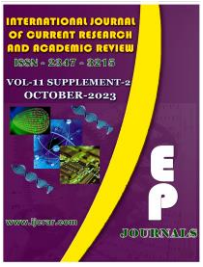

of MIQIS is a focus on the *modular* nature of information systems, encompassing XML, relational, text, and other data sources. The framework fully respects the autonomy of peers to manage locally their schemata and concepts. The two major components of MIQIS are a formal investigation of data interoperability and a practical implementation of modules driven by this investigation.

We are focusing on the relational module of MIQIS in our doctoral research. In this paper we present our initial results in this research, which is joint work with Catherine.

In Section 2 we present a novel algorithmic solution to the data mapping problem [4, 5]. Our approach views the data mapping problem as *search* in the full space of transformations on relational data. Our solution, which utilizes heuristic search, includes data to meta data transformations (and vice versa), allowing a generalization of previous solutions such as token-based schema matching. In Section 3 we present our initial results on a formal study of data interoperability [6]. We introduce a novel data model and calculus for expressing data mappings between relational data sources, laying the ground for a better understanding of the data mapping problem.

This definition encompasses all variants of the data map- ping problem discussed in Section 1. Note that and are not assumed to be schemas of the same data model. It is not immediately clear how to automate a solution to the *general* problem. In MIQIS, we focus on subcases of the problem by following a modular approach to information exchange. In our doctoral research we are developing the MIQIS module to generate SQL compatible transformations when both *relational* schemas.

We consider a fixed set of simple transformations on relational data. All structural transformations between the databases in Figure 1 can be performed using compositions of the following simple, compositional, structural transformations: for demoting metadata to data, for dereferencing attributes, for promoting data to metadata, for partitioning relations, for dropping attributes, the standard relational rename operator ρ, and a simple merge operator

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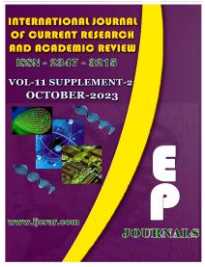

We omit a complete formal definition of the operators in this paper; these operators mimic algebraic operators developed elsewhere for federated relational systems [18].

Example 2

Consider the basic transformations involved in restructuring the information in G1 into the format of G2:

R_1 := (G1, Assignment, Percentage) ↑

Promote assignments to metadata with corresponding "Percentage" values.

We give concluding remarks and indications for future work in Section 5.

Data Mapping as a Search Problem

$\boldsymbol{R_2}$ **:=** ↓

R_3 := ↓

(R_1, Assignment)

Drop column "Assignment"

(R_2, Percentage)

Drop column "Percentage

Can the discovery of the mappings between databases in Figure 1 be (semi) automated? A very general statement of the data mapping problem is as follows:

Definition 1 (Data Mapping Problem)

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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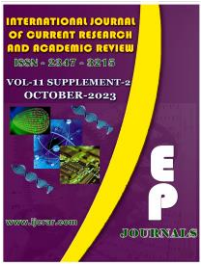

Given source data schema S, target data schema T, and query language L, find a transformation τ ∈ L (if it exists) such that for any instance s of S and corresponding instance t of T, s → t.

R_4 := $\rho(R_3,$ Name, Student)

Rename attribute "Name" to "Student"

R_5 := (R_4, Student)

Merge assignment grades for students.

The output relation R_5 is exactly G2.

Given illustrative "canonical" source and target instances (*s, t*) as input, we view data mapping discovery as an exploration of the transformation space of these operators on the source instance *s*. Search terminates when the transformed source instance *s* becomes a superset of the target instance *t*.

At this point, the transformational path is translated to a parameterized map between instances of the source schema and instances of the target schema. This process is illustrated in Figure 2. Approaching the data mapping problem as a search problem allows us to leverage existing artificial intelligence search techniques. In this approach, no as sumptions of common domains, global schema, underlying generative ontology, or other simplifications are made.

Data are treated simply as opaque objects; the search process is purely syntactically and structurally driven [1, 11]. The user-provided source and target instances provide the initial matches which drive the search process. A prototype search module for relational data mappings has been implemented in Scheme [4, 5]. We have tested this module with simple search heuristics and shown that it is effective for both schema matching and full data mapping.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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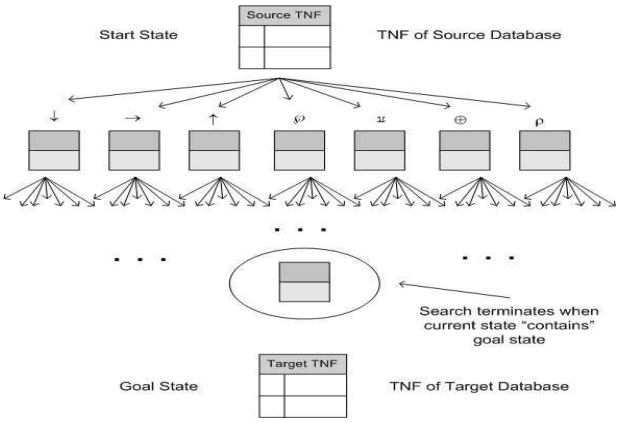
Fig.2 The search for data mappings



Data Mapping Calculus

The second contribution of our research is a simple declarative data mapping calculus (DMC) for reasoning about the data mapping problem. Our calculus is a minimal extension of the standard relational model for cleanly ex- pressing structural transformations for data mapping. This logical formalism complements our work on automating solutions to the data mapping problem [4, 5]. This is joint work with Edward Robertson and Dirk Van Gucht [6].

In the data model for the DMC, databases are named finite sets of tuples. Tuples, in turn, are named finite sets of ordered pairs over some infinite domain of atoms. Intuitively, the name of a tuple is its relation name and the ordered pairs are the attribute-value pairs of the tuple.

Example 3

In this data model, the single database G2 of Figure 1 has the following representation:

G2, ⟨*Grades,* {⟨*Student, Saori*⟩,
⟨*Assignment1, 94*⟩,
⟨*Assignment2, 97*⟩}⟩,

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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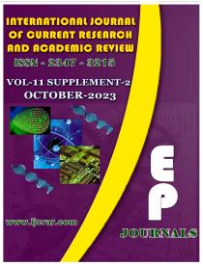

⟨*Grades,* {⟨*Student, Yukie*⟩,
⟨*Assignment1, 88*⟩,
⟨*Assignment2, 89*⟩}⟩

During data mapping, the output schema of a query is dynamic and not known at runtime. Hence null values have typically been introduced as special values indicating missing or inapplicable information. The data model for the DMC avoids the problems associated with this approach by viewing a null value as *absence*. For example, if a single student in G2 has the attribute-value, it is not necessary to explicitly have null values for the attribute extra-credit in the tuples of all the other students.

The DMC is essentially the standard relational calculus extended with simple syntax for seamlessly manipulating metadata; in particular, it is easy in DMC to express each of the algebraic transformations used in the data mapping solution presented in Section 2. We will present the language by examples which illustrate its expressive power.

Example 4

We begin with a standard query on database G1 to return the student names in the Grades relation in an output relation named Students:

$\{x : t \mid (\exists r : s \in G1)\ r = Grades \wedge x = Students \wedge t.Name = s.Name\}$

Intuitively, the new syntax " r : s G1" means "there exists a tuple s in relation r in database G1." The output is all tuples t with relation name x satisfying the query.

Next, we give two data-metadata queries. The query to map G1 to G2 (as in Example 2) must promote data values to attribute values:

$\{x : t \mid (\exists r : s \in G1)$
$x = Grades \wedge r = Grades \wedge t.Student = s.Name$
$\wedge\ (\forall r^j : s^j \in G1)(\forall a)\ r^j = r \wedge t.Student = s^j.Name$
$\Rightarrow (a = s^j.Assignment \wedge t.a = s^j.Percentage)\}$

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Note that the DMC syntax cleanly captures the dynamic output schema.

The query to map G2 to G3 must promote attribute names to relation names:

$\{x : t \mid (\exists r : s \in G2)(\exists a)(\exists v)\ r = Grades$
$\wedge\ a \neq Student \wedge s.a = v \wedge x = a$
$\wedge\ t.Name = s.Student \wedge t.Percentage = v\}$

It turns out that the full calculus is unsafe in several respects. Hence we are working on syntactic restrictions to make DMC equivalent to tractable languages for relational data-metadata querying [6, 18].

Related Work

Overcoming structural heterogeneity is a long standing problem in database research [12, 16]. We briefly discuss research related to our algorithmic solution and DMC.

The approaches to data mapping most closely related to our data mapping solution are the works of Bilke and Nau- mann [1] and Kang and Naughton [11] on schema matching, and the Clio project [15] on schema mapping. To our knowledge, these works have not considered the full space of data-metadata transformations, with only the Clio [15] project considering any aspects of such mappings. Our work complements and extends these works with a new perspective on the data mapping problem and a novel solution to this problem for the complete relational transformation space.

Our solution can be considered as a useful addition to a multi-strategy data mapping approach [3]. Our work on DMC is motivated by relational languages for database interoperability. The DMC is a descendant of the Uniform Calculus developed by Jain *et al.,* [9], specialized to investigate relational data mapping. Our calculus is a novel development of Jain's language that clearly captures a very minimal extension of the standard relational model for structural transformations for data mapping. Other influential research for our work is Chen *et al.,* [2] on higher order logic programming, Krishnamurthy *et al.,* [12], and Lakshmanan *et al.,* [13] on

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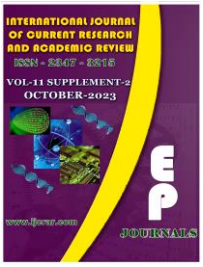

multidatabase languages, and Sattler *et al.,* [17] on languages for database federations. Our work complements and extends this research with a *logical* characterization of the full space of relational data map- ping transformations.

Conclusions and Future Work

In this paper we presented doctoral research on the data mapping problem for relational data sources. We discussed a novel solution to the data mapping problem addressing the full space of data-metadata transformations. This solution was founded on a new perspective on the data mapping problem as a search problem. We also discussed ongoing work on a formal underpinning for the data mapping problem. We developed DMC, a calculus for data mapping, and illustrated its appropriateness for expressing data mapping Transformations.We are currently enhancing the performance of our prototype algorithmic solution, incorporating improvements developed in the search literature and more sophisticated heuristics [4, 5]. We are also applying our approach to data mapping on the "deep web" [8]. Many thorny re- search issues remain to be explored for DMC. We are currently tackling safety issues and pinning down a fragment of DMC which is equivalent to tractable languages for data mapping [18]. In addition, with DMC in hand we are now in a position to clearly formalize the data mapping problem in terms of DMC decision proble

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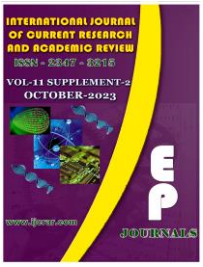

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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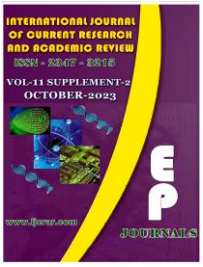

Full Length Article **IJCRAR/FL/07**

A Comparative Study on the Impact of Commercial and Homemade Cosmetics

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Abstract

In the present study, "A Comparative Study on the Impact of Commercial and Homemade Cosmetics", involves the identification of many different microorganisms in the cosmetic samples. The identified bacteria in face cream (old, new & homemade) are *Staphylococcus aureus*, Vibrio parahaemolyticus and Pseudomonas sp. In powder (old, new & homemade) Pseudomonas sp and Salmonella sp were identified and in lipstick (old, new & homemade) Vibrio parahaemolyticus, Staphyloccocus aureus and Pseudomonas sp were identified. The identified fungi in face cream (old, new & homemade) are Aspergillus niger, Aspergillus flavus and Aspergillus terrus. In powder (old, new & homemade) Aspergillus niger, Aspergillus fumigatus and Aspergillus versicolor were identified and in lipstick (old, new & homemade) Aspergillus flavus, Aspergillus niger and Aspergillus fumigatus were identified. In the study of preservative efficacy test from the commercial and homemade cosmetic samples of face cream, powder and lipstick (old, new and homemade) it show that during the incubation period of 28 days, the growth may slightly increase until 14th day and on the 28th day, the growth may slightly decreases due to the concentration of preservatives. Thus, when comparing to the commercial and homemade samples of the cosmetic product, the growth may also slightly varies and the homemade samples are much efficient than compared to commercial samples.

Keywords: Commercial cosmetics, Homemade cosmetics, Formaldehyde, Bacteria and fungi.

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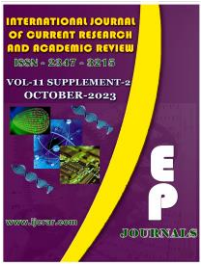

Introduction

In the 21st century, the winds of changes in society are blowing forcefully in all parts of the world for the application of cosmetics. The Cosmetic word originated from the Greek word "Kosmeticos" which means adorn and preparation. Cosmetics can be defined as external preparation meant for applying on external part of the body.

Cosmetics means any substance or mixture of substances that are applied to the human body for use in cleaning, coloring, conditioning, improving or altering the complexion for skin, hair, teeth, nails, lips or eyes. Cosmetics are generally mixtures of different chemical compounds derived from natural sources (such as coconut oil, plant extracts etc.) or may be synthetic or artificial (H.J.M.P Chamikara, 2019).

Almost all of the cosmetics used by human precipitated and lot of destructive outcomes occurs because of the components delivered to the cosmetics are as preservatives, stabilizer, perfume, and coloring agent (M. F Mansuri *et al.,* 2018). Fragrances also play a considerable role in making undesirable smells arising from fatty acids, oils and surfactants that are commonly used in cosmetic formulations (Jugreet B. Sharmeen *et al.,* 2021). The lack of regulation and adequate testing of talc-containing personal care products in the U.S. has resulted in the contamination of cosmetics with **asbestos** (Tasha Stoiber *et al.,* 2020).

Methodology

Serial dilution is performed for the samples with 1ml of Tween 80 and 8 ml of MLB (Modified letheen broth) was added and mix thoroughly.

Determination of Formaldehyde by Colorimetry Method

Formaldehyde Standard Solution

37% formaldehyde solution was diluted with 10ml of distilled water to various concentration of 0.4, 0.6, 0.8, 1.0 and 1.2 ml.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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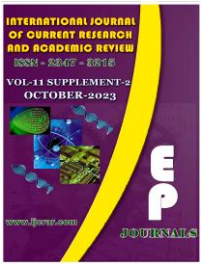

Acetylacetone Solution

Acetylacetone solution was prepared by dissolving 3 g of ammonium acetate with little distilled water, followed by adding 0.06 ml of acetic acid and 0.04 ml of acetylacetone and make to a total volume of 10 ml with distilled water.

Ammonium Acetate Solution

Ammonium acetate solution was prepared by dissolving 1.5 g of ammonium acetate in distilled water, followed by adding 0.03 ml of acetic acid and diluting with distilled water again to a total volume of 10 ml.

25% Sodium Sulphate Solution

12.5g of sodium sulphate was taken into a 100 mL volumetric flask, followed by 50ml of distilled water and shaken well until dissolved. Finally, it was diluted to the volume to prepare the solution.

Preservative Efficacy Test

Challenge test is also known as Preservative efficacy test. A challenge test is a procedure in which a product is challenged by exposure to specified types of bacteria and fungi to determine whether it is adequately preserved. Assessment of preservative efficacy is needed over the intended shelf-life of those products.

- Samples were placed into sterile containers and mixed with Tween-80, then it was inoculated with the standard strain of *Staphylococccus aureus*.
- Then it is incubated at 37°C for 28 days.
- At the interval time of 0, 14 and 28th day, the reading was measured in uv spectrophotometer at 625nm. 1 ml aliquots were removed and placed onto neutralizing media of letheen agar.

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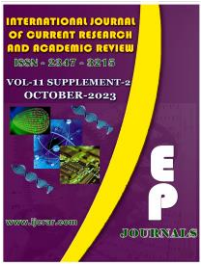

- Numbers of viable microorganisms in the inoculum suspension were determined by the plate count after incubating at 37°C for 24 hours and counts were expressedas colony forming units per gram (cfu/g) were determined.
- The acceptance criteria for bacteria were at least the second logarithmic reduction from initial count and no increase from the 14th day – 28th day.

Results and Discussion

Bacteria

Isolation of microorganisms from cosmetics samples was done by Serial dilution method in nutrient agar plate and identification was done by preliminary test, biochemical method and plating in selective media. *Staphylococcus aureus, Pseudomonas sp., Vibrio sp., Salmonella* sp., were identified.

Fungi

From the sample plated in Sabouraud dextrose agar (SDA) media, *Aspergillus sp.,* were identified. The results obtained from the cosmetic samples for the isolation of bacteria was similar when compared with the previous study (Mansuri M *et al.,* 2018).

Antimicrobial Preservative Efficacy Test

The antimicrobial preservative efficacy test is used to determine the efficacy of the preservative in the cosmetic products during the shelf and usage life. The results for the samples were observed at the interval of 0, 14 and 28th day of incubation.

The result from the previous study during the preservative efficacy test shows that the growth of microbial count increases on 14th and 28th day due to the ineffectiveness of the preservatives present in the sample (Ayse seher birteksoz tan *et al.,* 2013). Preservatives must be used at the lowest concentration that ensures their efficacy and this must be determined during the product development process as reported by Detmer *et al.,* (2010).

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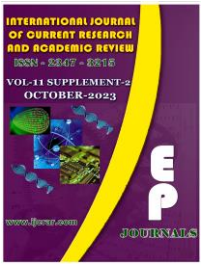

Conclusion

From the entire study, it can be concluded that microbial contamination is a current issue and microbiological safety is one of the most critical parameter for cosmetic quality.

This study revealed that many types of microorganisms were present in all the cosmetic samples of old, new and homemade. The preservative efficacy test determines that in old samples, the microorganisms from atmosphere and contaminated organisms present in our hands were grown. The new samples contains the concentration of the preservative is not sufficient for the growth of some organisms. Thus, the new product contains growth of non- pathogenic microbes. The homemade products have absence of preservative thus, the microorganism growth occurs. And when compared the commercial product of old and new, the homemade products contain less content of formaldehyde. The growth of normal flora is inhibited by the Ciprofloxacin antibiotic with higher resistant level and old sample contains more microorganisms when comparing to new and homemade. Thus the present study shows the evidence of chemicals which is been used for the preservative and storage process are hazardous or unsafe to the skin. To reduce these causes, natural products without any addition of chemicals are suggested for the healthy skin.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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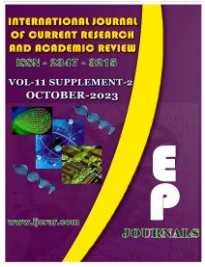

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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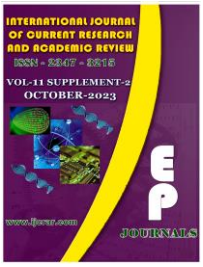

Full Length Article **IJCRAR/FL/o8**

Development of Biopolymer Film Incorporating Seagrass (Enhalus acoroides) Extract and its Antibacterial Activity

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Abstract

In the present study, "Development of Biopolymer Film Incorporating Seagrass (Enhalus acoroides) Extract and its Antibacterial Activity" involves the extract preparation from seagrass (Enhalus acoroides) using Ultrasonicator for incorporating that extract to develop a biopolymer film. It determined the density of molecular compounds present in the film forming solution and extract solution using UV visible spectroscopy. It forms the new developed biopolymer film by incorporating seagrass (Enhalus acoroides) extract, bovine Gelatin with the addition of plasticizer glycerol to obtain flexibility for the film and water at required amount is added. And the developed biopolymer film is subjected to analyse the presence of functional groups or polymer homogeneity by using FTIR (Fourier Transform Infrared Spectroscopy). Further the surface morphology of the developed biopolymer film is characterized by using the SEM (Scanning Electron Microscopy). The great impact on a polymer is to degrade more faster and should not harm the environment. Such as the soil burial test states this impact on the polymer used in this study. In the disc diffusion method, the developed biopolymer film placed on different bacteria shows the maximum zone of inhibition for GA10%(19mm) against *Staphylococcus aureus*, GA10% (19 mm) against Pseudomonas aeruginosa that is in correlation with the zone of inhibition in standard antibiotic used as a positive control, streptomycin of 20µg (19mm) against *Staphylococcus aureus* and streptomycin of 20µg (25mm) against Pseudomonas aeruginosa. From the application of developed biopolymer film on food supplements, the control films showed the high accumulation of contaminating (fungi) Rhizopus, in GA5% minimum, in GA10% less traces of contaminants. Thus, it indicates the appropriate barrier property percentage present in GA10% to wrap the high moisture content food supplements (strawberry, etc).

Keywords: Seagrass Extract (Enhalus acoroides), Biopolymer film, Food Packaging, Antibacterial Activity, Shelf life.

EXCELLENT PUBLISHERS

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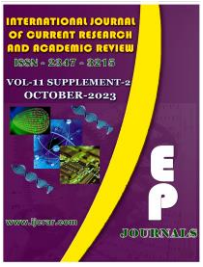

Introduction

Enhalus is a monotypic genus of marine flowering plants. The sole species is *Enhalus acoroides*. *Enhalus* is a large seagrass native to coastal waters of the tropical Indian and Western Pacific Oceans. It is the only species of seagrass that does aerial surface pollination in which the pollen and the styles remain dry (Larkum *et al.,* 2005).

Enhalus is surface pollinated with male flowers that detach from the plant to float on the surface until they reach a female flower where pollination can occur. *Enhalus acoroides* is considered a slow-growing, "climax" species (Duarte and Carlos M, 1991). Plasticizers, including glycerol made films and coatings are flexible to change their shape more efficiently (Embuscado ME and Huber KC, 2009).

Preparation of biopolymer films includes biopolymers dissolution or dispersion in different solvents solution evaporation and finally drying. This process (known as casting) is based on molecular weight reduction and polymer chains reorganization in the film matrix and it has been used for the production of polysaccharide and protein biofilms (Park *et al.,* 2014).

Biopolymer films directly extracted from biomass are usually classified according to the predominant constituent material (Falguera V *et al.,* 2011). They are utilized in confections (mainly for providing chewiness, texture, and foam stabilization), low-fat spreads (to provide creaminess, fat reduction and mouth feel), dairy (to provide stabilization and texturization), baked goods (to provide emulsification, gelling and stabilization) and meat products (to provide water-and fat- binding) (Karim AA and Bhat R, 2009).

There are two main types of gelatin. Type A, with isotonic point of 7 to 9, is derived using exclusively acid pretreatment. Type B, with isotonic point of 4 to 5, is the result of an alkaline pre-treatment (Gomez Guillen MC *et al.,* 2007).

Antibacterial activity of the developed film is performed for the analysis of bacteriostatic (inhibits the bacterial growth) or bacteriocidal (kills bacteria) activity in it against the selective

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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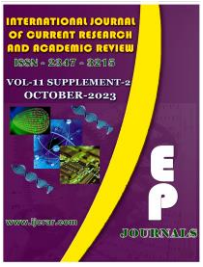

microorganisms (Elumalai EK *et al.*, 2014). As the films developed are intended for the packaging of food supplements and consumed with them, it is imperative to be safe from this point of view.

Materials and Methods

Seagrass (*Enhalus Acoroides),* Conical Flask, Centrifuge Tube, Spatula, Sterile Distilled Water, Sterile Petri plates, Bovine gelatin, Glycerol.

Collection of Seagrass

The seagrass (*Enhalus acoroides)* is collected from Kanyakumari Dt, by the marine plant collectors and the species is identified by the botanist who analyses the plant species. The plants were thoroughly washed with tap water to remove soil and dust particles.

Drying process

All plants are dried under shade at room temperature for one to two weeks.

Powdered seagrass

The dried plants were then grounded into a fine powder form. Seagrass extract was prepared by adding 5g of fine grounded seagrass (*Enhalus acoroides*) powder in 25ml of water which is used as aqueous solution. Ultrasonicator is used for the extraction of bioactive compounds from the extract preparation. A 750 W ultrasonic processor with a 13 mm diameter probe was used for extraction for 15mins at 20kHz.

The extract obtained from the ultrasonic processor is centrifuged at 18,000 rpm for 30 min. Now the supernatant is collected separately, freeze dried and ground into fine powder for further analysis. The samples of the film forming solution at two different concentration and the extract solution of 3ml were taken in a clean cuvette to analyze the presence of bioactive components that absorbs uv light rays at a wavelength from 200 to 800nm. The film forming solution was then cooled to 40° C and poured into the Petri dishes.

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International Journal of Current Research and Academic Review

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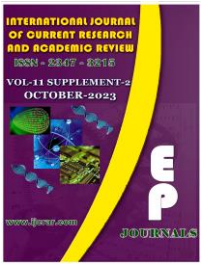

Then the film forming solution is dried for 48hr at ambient conditions in a laminar flow hood until the solvent was evaporated. Finally, a Control film was also prepared using the same procedure without extract addition and used for FTIR study. The films were cut into a square shape with a dimension of 10 mm × 10 mm and then oven dried at 60 ◦C overnight. The measurement of the spectra was done in transmittance mode and wavenumber range of 400 to 4000 cm^{-1}. Those spectra readings were obtained in peaks with concerned values. The film surface morphology was observed with SEM. The antibacterial activity of the test samples was carried out by disc diffusion method. The film were cut into (1× 2 cm) and placed in an oven for 24 hrs at 105◦ C.

Film Moisture Content

The initial *w*eight (Mi). before incubating in oven and the final weight (Mf) after incubation for 24 hrs were weighed.

Film Solubility

Dry film samples, after moisture content determination,(1× 2cm) were immersed in deionized water at room temperature for 30 min with stirring. After 30 min, excess water was decanted and samples were dried in the oven for 60 min and weighed (m3).

Film Swelling

Film samples (1x2 cm) were weighed (m1), and then dipped in deionized water at room temperature, for 2 min. Lastly, the samples were then removed from the water, the excess water was removed by a filter paper and samples were weighed (m2).

Soil burial

The test was setup with samples (3 cm × 3 cm) buried at ambient temperature and 4 cm below the soil with approximately 36% (w/w) moisture content. The degradation weights were measured after 0- 10 days.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Results and Discussion

Fig.1 Developed Biopolymer Film

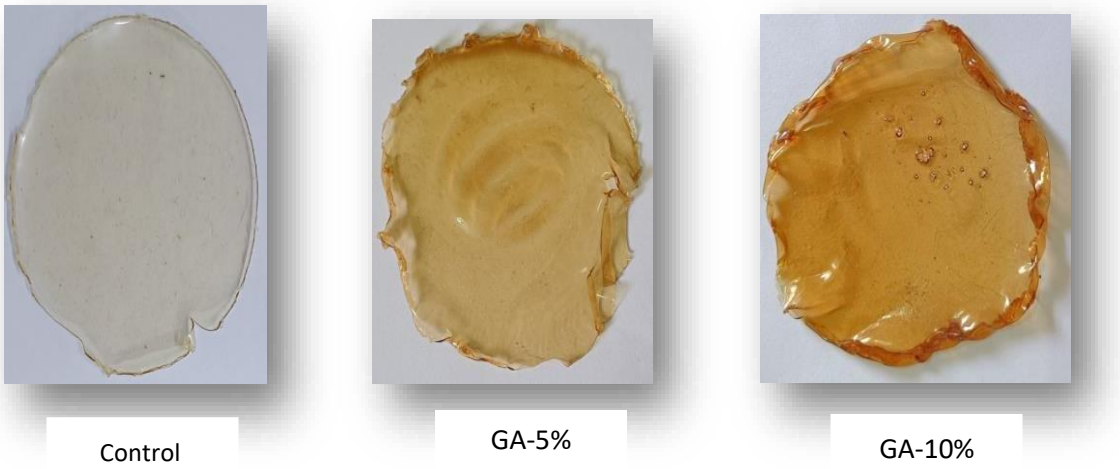
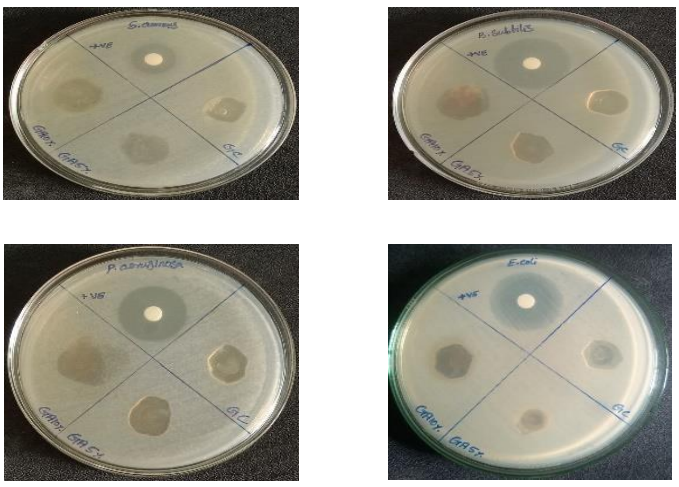


Fig.2 Antibacterial Activity



EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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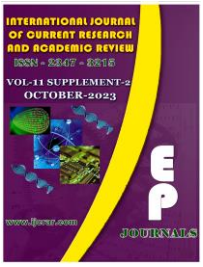

Conclusion

From the entire study, it can be concluded that microbial contamination is a current issue and microbiological safety is one of the most critical parameters during food storage, food packaging and biodegradability of polymers used in food packaging materials. This study revealed that the polymer used is safe and has durable properties to attain the shelf-life period of food supplements. The soil burial test of the developed biopolymer film determines that the GA5% and GA10% has a high biodegradable capacity due to the presence of high amount of cellulose and low amount of lignin in seagrass (*Enhalus acoroides*) extract incorporated in the developed biopolymer film. The biopolymer film developed using gelatin, glycerol, water and a natural antimicrobial material *E.acoroides* extract has antimicrobial effect against *Staphylococcus aureus, Bacillus subtilis, Pseudomonas aeruginosa, Escherichia coli* bacteria. Therefore, a blended film incorporated with an antimicrobial natural extract can be applied as a coating material in fresh fruit for controlling food borne pathogenic bacteria contamination during the post-harvest processing.

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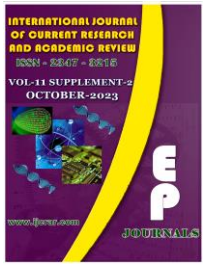

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EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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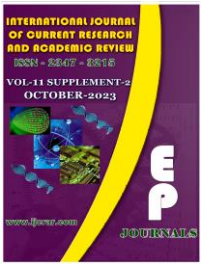

Full Length Article **IJCRAR/FL/09**

Biosensors for Milk Quality Monitoring and Detection of Microbial Spoilage Using Standard Methods

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Abstract

Milk is regarded as a perishable product because it is susceptible to microbial contamination and has a short shelf life, even when kept in a cool environment. Milk quality is essential to preserving food safety and human health. For the detection of contaminated milk, rapid analysis techniques must be employed. The detection of microorganisms and milk spoilage in this study was performed using biosensors. The use of biosensors facilitates sensitive, focused, quick, economical, and portable operations. The main objectives is on common biosensor methods for the detection and monitoring of the well-known markers of bacterial growth and milk spoiling, including EC, pH, Total Bacterial Count (TBC), Lactic Acid (LA) concentration, concentration of dissolved oxygen, and generated CO2. Recent studies have shown that several biosensors can be employed for the process of bacterial detection in food safety.

Keywords: Biosensors, Milk quality, Spoilage, Total bacterial count, CO2, Lactic acid and oxygen concentration.

Introduction

The challenge of milk spoilage is a pressing concern for both milk manufacturers and consumers, characterized by its elusive nature and the resultant difficulties in accurate measurement. This

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International Journal of Current Research and Academic Review

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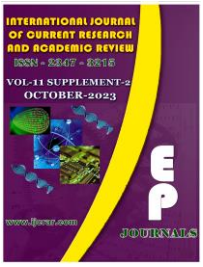

reviews deeps into the ramifications of this uncertainty, ranging from resource wastage and consumer discomfort to negative financial impacts on producers. Ambiguity surrounding expiration dates not only leads consumers to discard perfectly good milk but also deters them from purchasing products nearing their potentially inaccurate expiration dates, causing financial strain on milk producers.

In response to these challenges, the past decade has witnessed a surge in research aimed at developing more precise and efficient methods for detecting milk spoilage. These innovations encompass indicators based on pH, bacterial counts, and gas-sensor arrays. This article embarks on a journey through these diverse spoilage detection methods, assessing their respective levels of effectiveness. Additionally, it explores supplementary approaches designed to preserve milk freshness regardless of the detection method employed.

The collective aim is to offer a comprehensive understanding of the evolving landscape of milk spoilage detection and prevention. Unsafe food is estimated to cause 600 million cases of foodborne disease, annually. Thus, the development of methods that could assist in the prevention of foodborne diseases is of high interest. This review summarizes the recent progress toward rapid microbial assessment through biosensors and sensors designed to mimic human senses. Biosensors are closer to wide-scale implementation followed by spectroscopic techniques and then by spectral imaging techniques and sensors designed to mimic human senses (Pampoukis *et al.,* 2022). The primary focus is on biosensors for the detection and monitoring of the well-known indications of bacterial growth and milk spoiling, such as pH variations, changes in dissolved oxygen content, and generated CO2. These sensors have a number of benefits, including high sensitivity, quick response times, little sample preparation, compactness, and the ability to monitor milk deterioration in real time. (Poghossian *et al.,* 2019).

Biosensors

The term "biosensor" refers to a powerful and inventive analytical tool with a biological sensing function and a wide range of applications, including food safety, environmental monitoring, biomedicine, and drug development (Vigneshvar *et al.,* 2016). More specifically, biosensors have generated a lot of interest as one of the most effective and accurate ways of food analysis and food

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International Journal of Current Research and Academic Review

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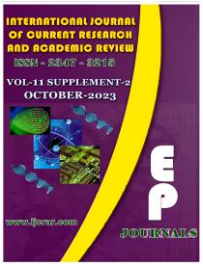
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



safety monitoring since they are frequently utilized in the identification and detection of bacteria (Rotariu *et al.,* 2016; Wisuthipha *et al.,* 2019; Lv *et al.,* 2019). Additionally, according to Barifidokht and Gooding (2014), biosensors frequently give quick, on-site tracking and so offer real-time information throughout the production process. Thus, biosensors are a diverse group of bacteria detection techniques.

Hameed *et al.,* (2018) stated that biosensors are analytical tools for the detection of microbial contamination. They work by interacting with biologically active substances, a transducer, and a signal conversion unit. According to Mayer and Baeumner (2019), biosensors usually have two basic parts: a target recognition component, such as receptors, nucleic acids, or antibodies, and a signal transducer that converts target recognition into physically observable signals.

Generally, biosensors can be classified into three major classes based on the type of transduction element: optical biosensors, mechanical biosensors, and electrochemical sensors (Jayan *et al.,* 2019). Biosensors could be used to quickly analyze the deterioration and quality of food by detecting a variety of substances, such as bacterial antigens, toxins, microbial contaminated byproducts, or spoiling precursors. (Ibrisimovic *et al.,* 2015; Ali *et al.,* 2020).

Milk Spoliage Detection Methods

pH Determination

The Milk determines the pH whether it is considered an acid or a base. The Milk in nature will be slightly acidic or close to neutral Ph. Fresh cow's milk has pH between 6.5 and 6.7. Over the time there will be change in the pH of the milk. If the milk goes sour, it becomes more acidic and the pH gets lower at 4.0- 5.0. This will be happened when the occurrence of lactic acid bacteria in milk converts lactose sugar into lactic acid (Ali *et al.,* 2017).

Total Bacterial Count (TBC)

A high microbiological quality of the raw milk will determine the quality of pasteurized milk and dairy products. To avoid spoilage of milk, the industry works to reduce the microbial load on

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International Journal of Current Research and Academic Review

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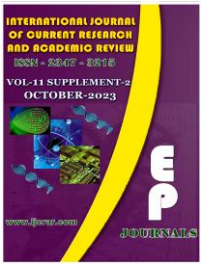
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



milk. This is accomplished by preventing contamination at the farm level, storing milk at a refrigerated temperature that prevents bacteria from reproducing, and monitoring bacterial levels by microbiological examination (Fusco *et al.,* 2020).

The Total Bacterial Count levels are positively correlated with both temperature and time of storage. In general, the milk stored at ≤4°C are not considerable increase of TBC is seen. However, significant increases are observed in milk stored at 6°C. Unhygienic milking and improper storage of milk are common in association with higher TBC. The raw milk will be had a microbial load mostly consists of few Genera are *Bacillus, Pseudomonas, Streptococcus, Lactococcus*, and *Acinetobacter*. Li *et al.,* (2018) investigated how seasonal variations in temperature and humidity can affect the milk microbiota, specifically *Acinetobacter* and *Firmicutes* at low and high temperatures and *Bacteroidetes* and *Proteobacteria* at low and high humidity. Indoor milk samples had a higher prevalence of host/gut-associated bacteria and Gram-positive bacteria.

Lactic Acid Concentration

Lactic acid concentrated milk is the product obtained by the fermentation of milk, which occurs either byspontaneous souring caused by various lactic acid-producing bacteria or an addition of mesophilic microorganisms into lactic acid, which coagulates casein at pH 4–5. The thick, sour-tasting curdled milk is manufactured from whole milk (at least 3.5 % milk fat), low-fat milk (1.5–1.8 % fat), or skim milk (at most 0.3 % fat). Sour milk contains 0.5–0.9 % of lactic acid (Belitz *et al.,* 2009).

Concentration of Dissolved CO_2

Carbon dioxide concentrations (% CO_2) were determined in triplicate as described elsewhere (Glass *et al.,* 1999). The inoculated milk samples indicating that the addition of low levels of CO_2 can decrease the rate of growth of microorganisms in refrigerated milk and thus extends shelf life.

Packaging of Milk and Dairy Products

Active packaging techniques relevant to dairy products make use of carbon dioxide absorbers, moisture/flavor/odor absorbers, releasing compounds, oxygen scavengers or by maintaining

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International Journal of Current Research and Academic Review

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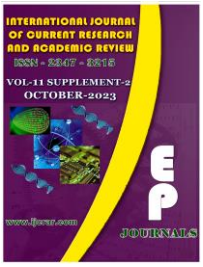

temperature control and antimicrobial packaging. Antimicrobial packaging gains interest due to their ability to deliver quality and safe food products. Due to the unique properties of dairy products, packaging is considered to be a critical step in the processing operations. The reason is that packaging is the last link in the processing chain.

Though traditional packaging materials were inert in nature without any interaction to the dairy product, current trends also focus on the development of an interactive packaging to increase the shelf life. They are generally known as active, smart or intelligent packaging. The nature and the characteristics of the dairy products to be packaged define the selection of an appropriate material and method (Rejeesh *et al.,* 2023).

Paperboard is a material that provides stability and strength to packaging. Tetra Pak, which is made of plastics and laminates, has an inner layer of polyethylene that seals in liquid contents, making it an excellent choice for packaging liquid milk. This polyethylene layer also serves to protect the product from external moisture.

Lacquered tinplate containers are well-suited for packaging ghee, especially for wholesale dealers when they need to store quantities ranging from 15 to 250 kilograms. Ghee packed in these containers remains stable and can be stored for about a year.

Ultra high temperature (UHT) processing is a method that extends the shelf life of milk by quickly heating it to a high temperature for a short time. However, the packaging of UHT products is crucial because UHT processing alone may not provide a long shelf life for milk. UHT milk, similar to pasteurized and sterilized milks, can be placed in plastic bottles and pouches.

Aseptic conditions refer to a state where there are no harmful germs like bacteria or viruses present. Aseptic packaging is a concept where a product is packaged under these germ-free conditions. This method is particularly important for UHT milk because it helps extend its shelf life. Aseptic packaging involves putting a sterile product into a sterile package within a sterile environment. The global market space of aseptic packaging is valued at around 50.86 billion USD in 2020. While it is expected to grow at a rate of 8.7 % CAGR from 2021 to 2027, the contribution of dairy segment is expected to be a mere 7 %. The consumption of aseptic packaging is expected

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International Journal of Current Research and Academic Review

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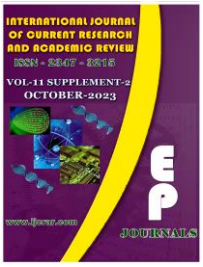

to increase with the growing packaging industry, especially in emerging economies of Asia Pacific region including India, China, and Japan.

The basic operations involved in aseptic packaging are.

- Heating the product to sterilization temperatures (140–150 °C for a few seconds)
- Maintaining the sterility of the products till they are cooled/packed
- Filling into sterile containers and sealing aseptically.

Aseptic packing enables the milk to have a shelf life of at least 3–6 months without any refrigeration. If refrigerated, a shelf life of up to 1 year is possible (Rejeesh *et al.,* 2023).

Conclusion

In conclusion, this article delves into a comprehensive exploration of various spoilage detection methods and their effectiveness, with a particular focus on enhancing milk freshness. In a world where unsafe food is responsible for millions of foodborne diseases annually, the development of effective methods for prevention is of paramount importance. The review underscores the recent advancements in rapid microbial assessment, particularly through the utilization of biosensors. These biosensors, capable of monitoring critical indicators associated with bacterial growth and milk spoilage, such as changes in pH value, dissolved oxygen concentration, and CO2 production, offer a range of advantages including high sensitivity, rapid response, minimal sample preparation, miniaturization, and real-time monitoring capabilities. As food safety continues to be a global concern, this article provides valuable insights into the evolving landscape of milk spoilage detection and prevention methods, contributing to the ongoing efforts to safeguard public health.

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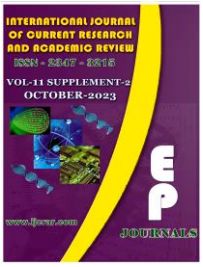

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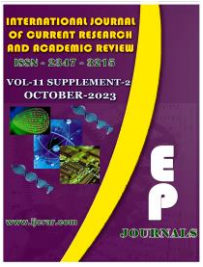

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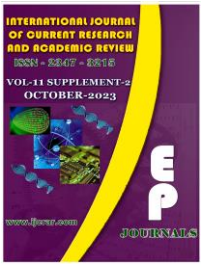

Full Length Article **IJCRAR/FL/10**

One-Shot Template-To-Text Generation Using Unsupervised Learning Algorithm with Natural Language Processing

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Abstract

The National Assessment and Accreditation Council (NAAC) conducts assessment and accreditation of Higher Educational Institutions (HEI) in India to derive an understanding of the 'Quality Status' of the institution. The University Grant Commission (UGC) has issued a decree stipulating that every university, Institutions and Faculty must get certification by the council called NAAC. NAAC accreditation focuses on improving the quality parameter of education. NAAC has provided 100 points to Innovations and Best Practices (Criteria VII) in overall assessment and accreditation of an Institution. Best practices are those which add value to human life and support main cause of an institution. The objective of the study is to propose auto generation of table-to-text using unsupervised learning with Natural Language Processing. Unsupervised learning is the training of a machine using information that is neither classified nor labelled and allowing the algorithm to act on that information without guidance. Natural language processing (NLP) is an interdisciplinary subfield of computer science and linguistics. It involves processing natural language datasets, such as text corpora or speech corpora, using either rule-based or probabilistic machine learning approaches.

Keywords: Unsupervised Learning, Natural Language Processing, One-shot Learning, NAAC.

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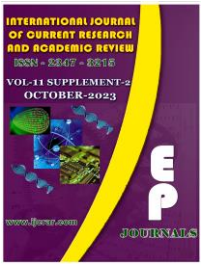

Introduction

Template-to-text generation, aiming at generating descriptive text about important information in structured data, has well application prospect in communicating with human in a comprehensible and natural way, such as financial report, medical report generation, etc. In recent years, data-driven models have shown impressive capability to produce informative and fluent text with the help of data table and Natural Language Processing.

Pre-Trained language models have shown promising progress in various natural language processing tasks. They can capture linguistic knowledge by pretraining on large-scale unlabeled dataset and generalize to downstream tasks with little labeled data in target domain, effectively modeling for one-shot learning.

Unsupervised learning is the training of a machine using information that is neither classified nor labeled and allowing the algorithm to act on that information without guidance. Here the task of the machine is to group unsorted information according to similarities, patterns, and differences without any prior training of data.

Natural language processing (NLP) is a machine learning technology that gives computers the ability to interpret, manipulate, and comprehend human language. Organizations today have large volumes of voice and text data from various communication channels like emails, text messages, social media newsfeeds, video, audio, and more. They use NLP software to automatically process this data, analyze the intent or sentiment in the message, and respond in real time to human communication.

One-shot prompting is used to generate natural language text with a limited amount of input data such as a single example or template. Template is static, it has fixed number of rows and column once you fixed the number of row and column in templates you can't add extra data. One-shot prompting can be combined with other natural language processing techniques like dialogue management and context modeling to create more sophisticated and effective text generation systems. In the context of prompt engineering, one-shot learning can be used to generate natural language text with a limited amount of input data.

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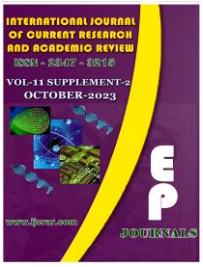

Related Works

Feng *et al.,* have become mainstream for table-to-text generation and achieved impressive performance with the help of large scale dataset.

Chang *et al.,* investigated unsupervised text classification under the umbrella name "Dataless Classification" in one of their earliest works.

Sappadla *et al.,* embedded text documents and textual label descriptions with Word2Vec and used cosine similarity between text and label embeddings to predict instances of unseen classes.

Haj-Yahia *et al.,* proposed to enrich label descriptions with expert keywords and subsequently conduct unsupervised classification based on Latent Semantic Analysis (LSA).

Nam *et al.,* jointly embedded document, label, and word representations with Doc2Vec. However, they learned a ranking function for multi-label classification and attempted to predict instances of unseen classes in a zero-shot setting for classification. Zhang *et al.,* integrated four types of semantic knowledge (word embeddings, class descriptions, class hierarchy, and a general knowledge graph) in a two-phase framework for 0SHOT-TC.

Yin *et al.,* proposed to treat 0SHOT-TC as a textual entailment problem, while Ye *et al.,* tackled 0SHOT-TC with a semi-supervised self-training approach.

Chen *et al.,* propose a switch model that use GPT-2 to generate template-like functional words while generating factual expressions via copying records' values from table in few-shot scenario.

Text Generation Approach

Baselines

We compare the findings of current state-of-the-art unsupervised text classification approaches to some basic baselines to evaluate their performance.

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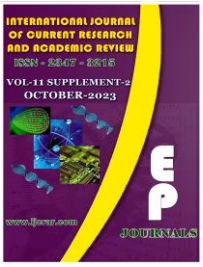

LSA

Singular Value Decomposition (SVD) is used on term-document matrices to learn a set of concepts (or topics) related to the documents and terms.

Word2Vec

This produces semantic vector representations of words based on surrounding context words

SimCSE

This is a contrastive learning framework that produces sentence embeddings which achieve state-of-the-art results in semantic similarity tasks.

SBERT

This is a modification of BERT that uses siamese and triplet network structures to derive semantically meaningful sentence embeddings.

Similarity-based Text Generation

As previously stated, numerous similarity-based approaches for unsupervised text classification exist. However, the recently introduced Lbl2Vec approach is focused on in this study. We chose Lbl2Vec to represent the similarity-based classification category since preliminary experiments confirmed improved performance compared with other similarity-based approaches.

One-shot Text Generation

1SHOT-TC is still relatively less researched, but nevertheless yields some promising approaches. Using pretrained 1SHOT-TC models can be considered an unsupervised text classification strategy, since one label information of target classes are required for training or fine-tuning. The One-shot entailment approach deals with 1SHOT-TC as a textual entailment problem. The underlying idea is similar to that of similarity-based text classification approaches. Conventional 1SHOT-TC classifiers can understand the actual problem since the label names are usually converted into simple indices. Therefore, these classifiers can hardly generalize from seen to

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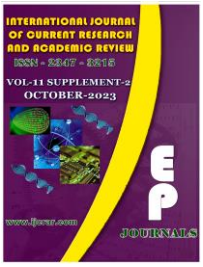

unseen classes. Considering 1SHOT-TC as an entailment problem, however, provides the classifier with a textual label description and therefore enables it to understand the meaning of labels with template.

Text Classification

Text Classification is the processing of labeling or organizing text data into groups. It forms a fundamental part of Natural Language Processing. In the digital age that we live in we are surrounded by text on our social media accounts, in commercials, on websites, Ebooks, etc. The majority of this text data is unstructured, so classifying this data can be extremely useful.

Text Classification can be achieved through three main approaches:

1.Rule-based approaches

These approaches make use of handcrafted linguistic rules to classify text. One way to group text is to create a list of words related to a certain column and then judge the text based on the occurrences of these words. These approaches require a lot of domain knowledge to be extensive, take a lot of time to compile, and are difficult to scale.

2.Machine learning approaches

We can use machine learning to train models on large sets of text data to predict categories of new text. To train models, we need to transform text data into numerical data – this is known as feature extraction. Important feature extraction techniques include *bag of words* and *n-grams*.

There are several useful machine learning algorithms we can use for text classification. The most popular ones are:

- Naive Bayes classifiers
- Support vector machines
- Deep learning algorithms
- KMeans algorithms

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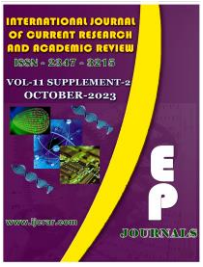

3.Hybrid approaches

These approaches are a combination of the two algorithms above. They make use of both rule-based and machine learning techniques to model a classifier that can be fine-tuned in certain scenarios.

Data Template

Our evaluation is based on four text classification data templates from different colleges. As we use the semantic meaning of class descriptions for unsupervised text classification, we infer label keywords from each class name that serves the purpose of textual class descriptions. Thereby, the inference step simply consists of using the class names provided by the official documentation of the datasets as label keywords.

In a few cases, we additionally substituted the class names with synonymous or semantically similar keywords, if we considered this to be a more appropriate description of a certain class.

1. College_type(Engg, college / Medical College / Arts & Science)
2. Location(Urban / Semi urban / Rural)
3. College_category(Govt. / Autonomus / Aided / Self-financing)
4. Stud_info(Community / first graduate / sportsmen / etc)

Experimental Design

For evaluation of different unsupervised text classification approaches, we use the datasets described in data template. Since we don't use label information to train the classifiers, we concatenate the training and test sets for each dataset and use the respective entire concatenated datasets for training and testing. After checking the many college's NAAC report, we observe that some answers we try to classify.

We use the label keywords from the given table for all text classification approaches to create class representations. Additionally, for the baselines and similarity-based approaches, we use the

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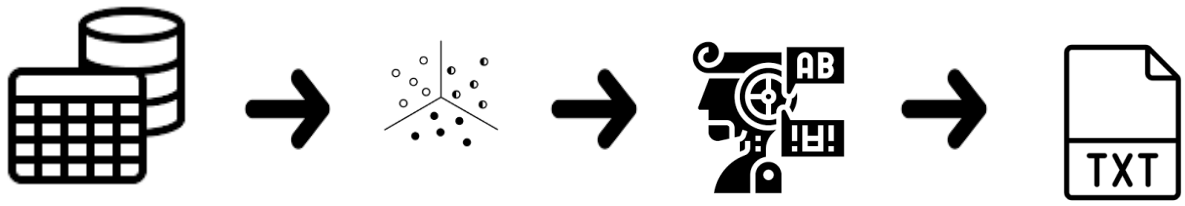
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

average of the respective label keyword embeddings as class representations. In contrast, for the one-shot approaches, the respective label keywords of the 30 similar college classes are concatenated with "and" and then used as hypotheses/label descriptions.

Fig.1



K-Means algorithm

K-Means Clustering is an Unsupervised Machine Learning algorithm, which groups the unlabeled dataset into different clusters. Unsupervised Machine Learning is the process of teaching a computer to use unlabeled, unclassified data and enabling the algorithm to operate on that data without supervision. Without any previous data training, the machine's job in this case is to organize unsorted data according to parallels, patterns, and variations. The goal of clustering is to divide the population or set of data points into a number of groups so that the data points within each group are more comparable to one another and different from the data points within the other groups. It is essentially a grouping of things based on how similar and different they are to one another. We are given a data set of items, with certain features, and values for these features (like a vector). The task is to categorize those items into groups. To achieve this, we will use the K-means algorithm; an unsupervised learning algorithm. 'K' in the name of the algorithm represents the number of groups/clusters we want to classify our items into.

Evaluation

Template will be assigned as One-shot prompt for K-Means algorithm as unsupervised learning. K-Means algorithm use unlabeled, unclassified data and enabling to classify the text. That text will be generated as a synthetic message of content with use of Natural Language Processing.

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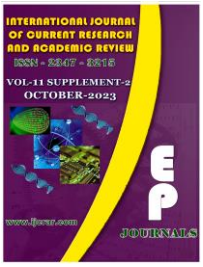

Fig.2 Python

```
importnumpyasnp
fromsklearn.clusterimportKMeans
fromsklearn.metricsimportsilhouette_score
# Create a sample table
X = np.random.randint(100, size=(20, 5))
# Apply unsupervised learning
for i inrange(2, 10):
 km = KMeans(n_clusters=i)
y_pred = km.fit_predict(X)
print('num_clusters: ' + str(i) + "\t" + str(silhouette_score(X, y_pred)))
```

We are using the KMeans algorithm from the scikit-learn library to cluster the data in the table. scikit-learn is an open-source Python library that implements a range of machine learning, pre-processing, cross-validation, and visualization algorithms using a unified interface. The silhouette score is used to evaluate the quality of the clustering results. By adjusting the number of clusters, you can generate different text outputs based on the patterns and relationships in our table.

Conclusion

In this work, we present scikit-learn library, which enhances KMeans algorithm for template-to-text generation with two auxiliary tasks, table structure reconstruction and content matching, for improving text fidelity. In detail, we use table transformation to bridge the gap between structured table(template) and natural language processing.

In addition, the content matching task guides model to generate high-fidelity task with less incorrect expressions that are contradicting to the table via measuring distance between template and information in generated text. Our model achieves new state-of-the-art performance in one-shot setting.

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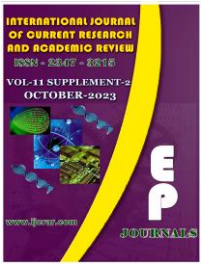

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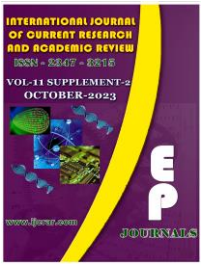

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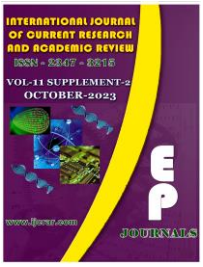

Full Length Article **IJCRAR/FL/11**

A Critical Evaluation of Embryo Assessment Human and Machine Learning Perspectives

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Abstract

Infertility affects one out of seven couples around the world. Therefore, the best possible management of the in-vitro fertilization (IVF) treatment and patient advice is crucial for both patients and medical practitioners. Embryo assessment plays a pivotal role in the success of assisted reproductive technologies (ART), particularly in procedures like in vitro fertilization (IVF). Traditionally, human embryologists have relied on their expertise to visually evaluate embryo quality based on morphological attributes. However, the advent of machine learning (ML) has introduced new possibilities for objective and efficient embryo assessment. In this study, we present a SWOT (Strengths, Weaknesses, Opportunities, Threats) comparison of human and ML-based approaches to embryo assessment. When experts (embryologists) look at embryos, they can notice small details and adjust their assessments based on differences they see. But sometimes, their opinions can be different from each other due to personal views, and there aren't fixed rules everyone follows. On the other hand, machines using a technology called machine learning can quickly look at lots of embryo information. They don't have personal opinions, so they can be fair. They might also find things that are hard for people to see. However, these machines need good and varied information to learn from. If they don't have that, they might not work well, especially for rare things. Also, it's tricky to understand why these machines make certain decisions, which can cause ethical problems. So, it's important to use both human expertise and machines together. This way, we can get better results in assessing embryos. But we need to be careful and make sure we understand and control the machines well. By merging human expertise and ML algorithms, a hybrid approach can enhance accuracy and efficiency in embryo assessment. Ongoing learning and refinement of ML methods hold promise. However, excessive reliance on automation raises concerns about devaluing human skills and requiring responsible oversight. Collaboration between human and ML-based assessment is highlighted, emphasizing the need for balance between clinical expertise and computational power. Future efforts should prioritize transparent, ethical AI-assisted strategies to uphold patient care and reproductive success.

Keywords: embryo assessment, assisted reproductive technologies, in vitro fertilization, human expertise, machine learning, SWOT analysis.

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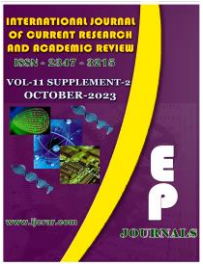

Introduction

Embryo assessment is really important for procedures like in vitro fertilization (IVF), which helps people have babies. Experts called human embryologists have been looking at embryos to decide if they're good for a long time. They check how embryos look to see if they're healthy. But now, there's a new way using computers and smart technology called machine learning (ML). This special technology can look at embryos using lots of information and help decide if they're good too. It's exciting because it's fair and uses lots of data, but it's also different and new. The way people look at embryos, using their experience, can find small differences and adjust for changes in how they look. But this way has some problems. It can be different from person to person, and there are no set rules everyone follows. On the other hand, computers using something called machine learning (ML) can quickly look at lots of information about embryos. They don't have personal opinions, so they can be fair. They can also find things that are hard for people to see.

The good thing about ML is that it can help with the problems we talked about earlier. It can make the assessment process more similar and clear. But using ML also has challenges. These computers need good, different, and representative information to learn from. If they don't have that, they might not work well, especially for things that are not common. Also, it's not easy to know how these computers make their decisions, which can cause some worries. As we start to learn more about embryo assessment, it's clear that we need to think carefully using a special method (SWOT) to understand the good and not-so-good things about both human and computer ways. This special way can show us where each method is strong, where they need improvement, and what challenges they might face. By doing this, we hope to find a balanced way that uses both human skills and computer power to make embryo assessment better. This can help families who want to have babies by improving the technology we use.

Background

Embryo assessment

Embryo assessment is a vital part of helping people have babies through assisted reproductive technologies (ART). One popular method is in vitro fertilization (IVF), where eggs and sperm are

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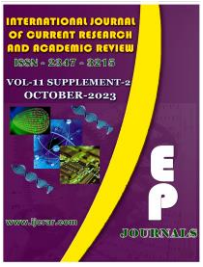

combined outside the body to create embryos for later implantation in the uterus. Picking the best embryos for IVF success is crucial. Traditionally, experts called human embryologists have been looking at embryos under a microscope. They check things like size, shape, and other features to decide which embryos are healthy and more likely to result in a successful pregnancy. But now, there's a new way using computers and smart learning called machine learning (ML).

This technology can look at lots of data from different embryos and learn which ones are likely to work best. It's exciting because it can help make the embryo assessment process more fair and accurate.ML is good at finding hidden patterns that humans might miss. It's like teaching a computer to recognize good embryos based on a lot of examples. However, using ML also comes with challenges.

The computer needs a lot of good data to learn from, and sometimes it's hard to understand why it makes certain decisions. The idea is to combine the expertise of human embryologists with the power of computers. By understanding the strengths and weaknesses of both methods, we can develop a better way to assess embryos for IVF. This can improve the chances of successful pregnancies and make the process more reliable and fair for families.

Machine Learning

Machine Learning (ML) is a part of Artificial Intelligence (AI) where machines learn to do intelligent tasks without direct human involvement. They learn from past experiences and observations to get better at specific jobs over time. ML techniques are used in different stages of In Vitro Fertilization (IVF) treatment, as discussed in a recent review**.**

ML algorithms can be categorized in various ways. Here, we'll talk about the two main categories

Supervised Learning

This involves creating mathematical models from data that includes both inputs and labeled outputs. The algorithms learn the relationships between inputs and outputs from the training

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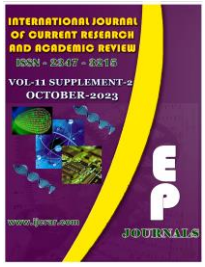

data and use this to predict outcomes in new, unseen data. It's like learning patterns from examples. Supervised learning has two types:

Classification

Here, the goal is to categorize things into different groups. For instance, predicting whether an IVF treatment will be successful or not.

Regression

This is about predicting continuous values, like estimating the number of days until pregnancy.

Unsupervised Learning

In this category, models are built from data that only has inputs, without labeled outputs. Unsupervised methods find hidden patterns in data without needing labels. One popular technique is clustering, where similar data points are grouped together to find common traits. Unsupervised learning doesn't need prior information about the data's structure.

AI and ML techniques have been used in medical studies, including in IVF

Pregnancy Prediction

ML models can predict the success of IVF for patients undergoing treatment. This helps doctors anticipate outcomes and plan better.

Embryo Evaluation

ML models help embryologists pick high-quality embryos for transfer, increasing the chances of pregnancy and reducing the risk of multiple pregnancies. The paper talks about how AI and ML are applied to different datasets involving a range of follicles and human embryos. AI and ML offer promising methods for improving human reproduction and embryology.

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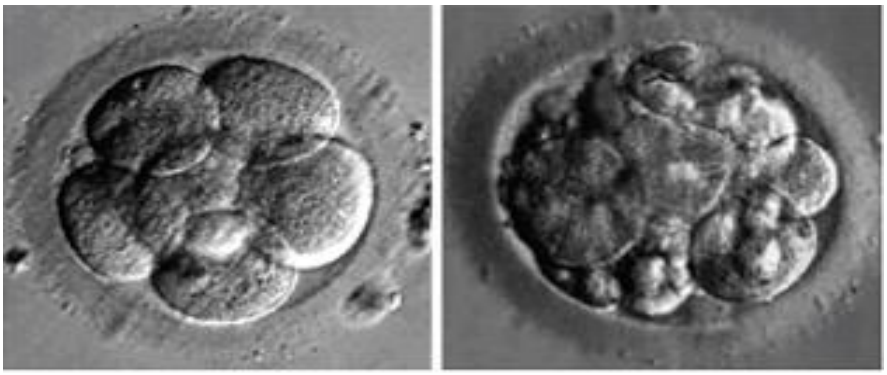
In simpler terms, ML is like teaching computers to learn from examples and make smart decisions. It's used in IVF to predict pregnancy success and choose the best embryos, which can help more couples have successful pregnancies.

Fig.1 Judging embryo quality

(a)A good-quality (grade A)embryo (left) and poor-quality (grade C) embryo (right) On Day 3 after fertilization, from CHR's laboratory



(b)Good day-5 embryo: Expansion level 5, ICM grade A, TE grade A. Bad day-5 embryo: Expansion level 3, ICM grade C, TE grade C

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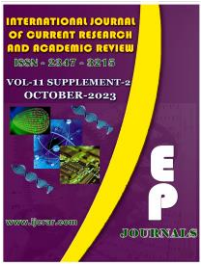

A study grouped factors for predicting IVF outcomes into four categories: treatment, female characteristics, male characteristics, and embryo traits. For instance, treatment factors included measurements like anti-mullerian hormone (AMH) and endometrial thickness. Female age, BMI, and infertility diagnosis were important female characteristics. Male age and sperm features, such as motility, played a role. Embryo morphology was also assessed. While some factors are unchangeable, others depend on medical choices, embryo evaluation, and consultation. These factors involve human intervention and can vary among professionals. Developing error-free systems to reduce this human influence is crucial.

Although no previous study has performed a SWOT analysis on human vs. ML-based embryo evaluation, similar analyses have been done in related areas. One study applied SWOT to create individualized medical strategies. Another focused on ML in radiology, highlighting its strengths in diagnosis and reducing manual work. Pre-implantation genetic testing (PGT-A) was studied for disease prevention.

ML is revolutionizing healthcare by reducing stress on staff and improving systems. ML assists clinicians in repetitive tasks, enhancing decision-making. For a comprehensive view of IVF, other studies outline its history, and time-lapse imaging algorithms have outperformed traditional methods. AI-driven approaches like deep learning offer reproducible embryo selection and personalized strategies. Overall, understanding these studies provides insights into IVF's progress and potential, with ML playing a transformative role.

Human Based – ML Based embryo Selection

Table 1 illustrates the SWOT analysis for human-based embryo assessment, detailing its strengths, weaknesses, opportunities, and threats, along with the associated recommendations and strategies derived from the findings.

Table 2 provides a qualitative and descriptive examination of ML-based embryo assessment through the application of the SWOT methodology. The presentation begins with an elaborate elucidation of each constituent within Table 2, bolstered by substantial supporting evidence and pertinent references. Subsequently, in Section VI, the strategies are put forth and deliberated upon, considering the present state of this approach.

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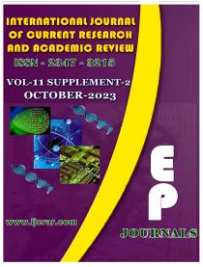

Strength Analysis

Human-Based Embryo Selection

IVF, which began about 40 years ago, has seen remarkable scientific progress and innovations. Notably, micro-manipulation of human gametes in the late 1980s, including intra-cytoplasmic sperm injection (ICSI), marked a significant milestone. Advances in methodology have improved success rates for couples dealing with infertility, particularly for women under. However, success decreases with age. IVF has had a substantial impact, resulting in over 4 million healthy babies and changing perceptions of reproduction. A key IVF component is selecting the best embryo for transfer. Currently, a non-invasive morphological assessment is used, involving criteria like cell count, fragmentation, and developmental stage (H-S4). The endometrium acts as a quality control system, filtering out embryos with severe abnormalities to prevent miscarriages. A good-quality embryo, likely to harmonize with the endometrium, increases the chance of a successful pregnancy (H-S1). Monitoring embryo morphology improves implantation rates and predicts multiple pregnancies. Around 34.5% of patients with high-quality embryos become pregnant. Embryologists adhere to the Alpha/ESHRE consensus for embryo evaluation, but adapt guidelines for abnormal cases (H-S4), leading to variations across IVF centers.

ML-Based Embryo Selection

Inter-embryologist bias and inconsistency impact IVF outcomes (ML-S1). This stems from varying expertise and evaluation inconsistencies among embryologists. Research demonstrates that well-designed ML models can outperform experts in predicting embryo implantation. ML-based applications offer reliable predictions when trained on sufficient data. Manual embryo assessment is costly and error-prone, while automated ML models, performing tasks without manual intervention, reduce errors and workload (ML-S2). Automation also saves time and cost, allowing embryologists to focus on other tasks. Data quality, model monitoring, and failure handling mechanisms are crucial.ML and DL, known for grasping complex relationships (ML-S4) in data without strict assumptions, are valuable when relationships are nonlinear or predictors are numerous. ML simplifies noisy data by spotting patterns (ML-S5), proving advantageous over standard statistics for predicting rare outcomes.

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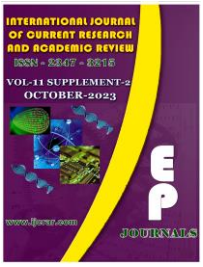

Table.1 SWOT analysis of human-based embryo selection table

	Strengths	**Weaknesses**
	H-S1: Morphological evaluation of human embryos **H-S2**: Increase of implantation rate **H-S3**: Decrease of miscarriage rate **H-S4**: Flexible and versatile multitasking performance	**H-W1**: Embryo damages **H-W2**: Time-consuming for iterative tasks **H-W3**: Misevaluation and inconsistent procedure among IVF centers **H-W4**: Inappropriate data handling **H-W5**: Meeting the saturation threshold **H-W6**: Biasing decision-making
Opportunities **H-O1**: Counter aging populations **H-O2**: Developing the IVF market **H-O3**: Research and academic opportunities **H-O4**: Single parent by choice / Donor gametes	**SO strategy** **H-SO1**: Attempt to improve the implantation rate (H-S2) and mitigate the miscarriage rate (H-S3) simultaneously provides an effective infertility treatment and counter aging populations (H-O1). **H-SO2**: The IVF market (H-O2) and research activities (H-O3) facilitate ML-based solutions using morphological evaluation (H-S1)as references toward overcoming challenges of human multitasking performance(H-S4)	**WO strategy** **H-WO1**: Development of state-of-the-art equipment and technology (H-O2, H-O3) offer solutions to assess without disturbing the embryo development (H-W1), save time for iterative tasks (H-W2), improve the general performance (H-W3) and data handling procedure (H-W4). **H-WO2**: Research and develop (H-O3) a new scalable procedure (H-W4) to provide a fair evaluation (H-W6) and pass the saturation threshold (H-W5).
Threats **H-T1**: High cost for a successful pregnancy **H-T2**: Requirement of many IVF cycles for a successful pregnancy **H-T3**: Negative pregnancy test **H-T4**: Multiple pregnancy **H-T5**: Lack of experts **H-T6**: Work overload	**ST strategy** **H-ST1**: When the implantation rate is high (H-S2), and the miscarriage rate is low (H-S3), the number of required IVF cycles (H-T2) will be reduced, their corresponding costs (H-T1) and the daily workload of embryologists (H-T3) is reduced.	**WT strategy** **H-WT1**: Holding medical group consulting mitigates biased results (H-W2), avoids the misevaluation (H-W4) due to the lack of expertise (H-T5).

Weakness Analysis

Human-Based Embryo Selection

Human-based embryo selection has strengths but also drawbacks. Taking embryos out of the incubator for assessment disrupts their environment, potentially harming them (H-W1). This

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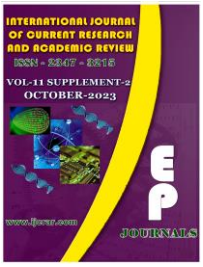

practice is repeated and can damage embryos over time (H-W2). Quick assessments due to environmental concerns risk mistakes and subjective variation (H-W3). Ineffective data handling, using free text and letters, hampers efficient storage (H-W4). Morphological embryo evaluation is debated; good-looking embryos may not always lead to success (H-W5). Slow pregnancy rate increase (2%) from 2012 to 2013 suggests limited progress (H-W5). Embryologist bias can affect decisions due to differing views and experience (H-W6). Rule-based evaluations, like cell count and DNA fragmentation, have limitations and might be complex (H-W6).

ML-Based Embryo Selection

Achieving success with machine learning (ML) hinges on the quality of training data, yet generating such data is often a time-consuming and expensive endeavor (ML-W1). Neglecting proper model validation can lead to overfitting, causing models to perform poorly on new and unseen data. The advancement of sophisticated ML techniques often comes with increased hardware requirements (ML-W2), where graphics processing units (GPUs) can accelerate training but also introduce practical challenges in deployment. Interpreting ML models, especially within intricate fields like medicine, remains a challenge due to their inherent lack of transparency (ML-W3). In medical contexts, understanding the rationale behind an ML model's decisions is crucial for ethical and legal considerations. Notably, the "black box" nature of some ML models can hinder their acceptance in clinical settings. Furthermore, while ML can excel in specific tasks, it may not be suitable for all medical applications (ML-W4). Complex, interventional obligations like diagnosis and treatment continue to be primarily within the purview of human medical professionals. Although ML can provide valuable support, it is important to recognize its limitations and ensure that its implementation aligns with the expertise of healthcare practitioners.

Opportunity Analysis

Human-Based Embryo Selection

Declining fertility affects aging populations globally, leading to fewer working-age adults due to later childbirth. By 2050, the elderly population is predicted to double, reaching around 2 billion.

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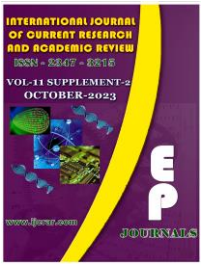

Older couples with poor IVF prognosis according to Bologna criteria face challenges. Advances in hands-on embryo selection offer hope to counter this (H-O1).Rising infertility cases and technology drive the upcoming IVF market (H-O2). ART service usage has grown 5-10% annually. In 1996, the US saw 60,000+ ART cycles, resulting in over 17,000 clinical pregnancies and 14,000 live births (H-O2). In 2019, the global IVF market was worth ~$18.3 billion, with the IVF instrument market at >$800 million. The IVF services market is expected to grow due to increased infertility rates and delayed pregnancies, though unevenly distributed globally. WHO recommends addressing infertility as a global health issue, advocating for assisted reproduction technology in low-resource nations. Expanding fertility clinics and reducing IVF costs in developing countries can boost the market. IVF serves as translational research, significantly improving health outcomes and the market. A simplified lab method for human IVF showcased positive results.IVF serves not only to create healthy babies but also caters to social and ethical concerns. It aids desired single parenthood and provides options for infertility couples through donor sperm or eggs (H-O4).

ML-Based Embryo Selection

One key opportunity is fostering collaboration between academia and industry to address embryo assessment challenges (ML-O1). The surge in IVF cycles has strained embryologists, prompting collaborative efforts for quicker innovation application and better patient outcomes. An example is Harrison AI, a clinician-led healthcare AI company enhancing IVF products. Embryo assessment greatly influences IVF success. Traditional manual microscopy faces issues like inconsistency, damage, and subjectivity. Time-lapse microscopy automates evaluation while preserving natural embryo development (ML-O2). Machine learning (ML) and deep learning (DL) offer accurate embryo classification. For instance, an ML model predicted implantation outcomes based on clinical features, and DL assessed embryo quality from time-lapse images. AI's impact on IVF and embryo selection is noted in various sources. Reliably evaluating embryos is a challenge due to the complex, non-linear relationship between treatment decisions and pregnancy chances. Traditional methods group factors like treatment, male, female, and embryo characteristics, though predicting outcomes is tough. AI-driven approaches offer reproducible procedures, uncover new embryo selection strategies, and reduce human involvement (ML-O4, ML-O5).

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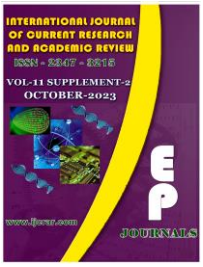

Table.2 SWOT analysis of ML-based embryo assessment

	Strengths **ML-S1**: Avoiding operator-dependent bias **ML-S2**: Automatic operation **ML-S3**: Reasonable operation cost **ML-S4**: Representing complex relationships **ML-S5**: Detail-oriented evaluation	**Weaknesses** **ML-W1**: Data availability **ML-W2**: Hardware availability **ML-W3**: Lack of transparency **ML-W4**: Inflexible performance **ML-W5**: Time consuming for development
Opportunities **ML-O1**: Supporting a multidisciplinary collaboration **ML-O2**: Developing new embryo evaluation procedure **ML-O3**: Passing the saturation threshold of the conventional approach **ML-O4**: Reducing human intervention	**SO strategy** **ML-SO1**: Form a collaborative group between embryologists and researchers (ML-O1) to develop ML models for unbiased (ML-S1) and automatic operation (ML-S2).	**WO strategy** **ML-WO1**: Make ML models transparent and interpretable (ML-W3) motivates multidisciplinary collaboration (ML-O1).
Threats **ML-T1**: Resistance to change **ML-T2**: Lack of system integration **ML-T3**: Information privacy **ML-T4**: Ethical and legal implications	**ST strategy** **ML-ST1**: Persuade embryologists and patients (ML-T1) gradually by presenting the benefits of applying ML models in embryo evaluation (ML-S1 - ML-S5).	**WT strategy** **ML-WT1**: Encourage multidisciplinary collaboration and research to upgrade the infrastructures and reduce the development time.

Threat Analysis

Human-Based Embryo Selection

IVF, a cutting-edge technology, demands advanced facilities and skilled specialists, but its cost often makes it inaccessible to patients (H-T1). Global ART expenses vary widely, with an average IVF cycle priced at $9266 in the US and $3956 in Japan. Developing nations face financial barriers,

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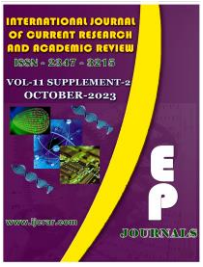

requiring around $3000 in Vietnam or $6000 in Bangladesh, coupled with additional charges for medications, consultations, and tests. Unfortunately, IVF is generally not covered by health insurance worldwide, leading to treatment delays (H-T2). Success rates decline with age, impacting financially stable couples opting for multiple cycles. Although some governments provide partial IVF cost coverage, insurance for private infertility care is rare in developing countries.

Human-based embryo assessment poses risks (H-T3), as relying solely on visual characteristics may lead to implantation failures due to unaddressed genetic issues, sperm defects, and more. Multi-pregnancies (H-T4) pose health hazards; transferring multiple embryos elevates the chances of multiple births, prompting guidelines to restrict embryos per cycle. Embryologists face complex choices in embryo selection (H-T5), impacting implantation rates and leading to challenges for junior embryologists. This may result in the transfer of excessive embryos, potentially causing multi-pregnancies. Enhanced selection could alleviate multiple pregnancies, easing decision-making stress and reducing workload for embryologists (H-T6).

ML-Based Embryo Selection

AI-based embryo assessment relies on data but can face resistance due to lack of understanding, generating challenges among embryologists and clinicians (ML-T1). Four types of resistance, including organizational, cultural, technological, and ethical, are identified. An investigation showed that cultural resistance posed a greater obstacle than technology in organizations implementing AI-based models. Clear explanations of AI outputs are crucial for adoption. System integration is a concern in using ML models for embryo selection.

Regulatory and operational factors, like data quality and security, must be considered (ML-T2). Digitizing and automating processes are vital steps for successful ML integration in healthcare. Data privacy and security (ML-T3) are significant issues due to AI's reliance on patient data. Privacy safeguards are essential for AI and ML in healthcare. Ethical concerns (ML-T4) revolve around AI's role in healthcare decisions, particularly the opacity of some algorithms. Ethical regulations are needed to address transparency, consent, and accountability issues. Healthcare institutions should establish rules to manage and mitigate these concerns responsibly.

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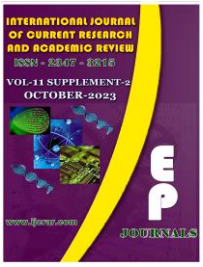

Conclusion

The initial step involves the identification of four distinct perspectives within a SWOT analysis for human-based embryo evaluation. This analytical framework, known as SWOT (Strengths, Weaknesses, Opportunities, Threats), offers a structured method for comprehensively examining the systematic integration of novel medical technology.

Over the past decades, human-based embryo selection has yielded numerous advantages in the realm of reproductive medicine. However, there is a growing recognition that the performance of this procedure may be nearing a saturation threshold, indicating its potential limitations.

Consequently, there arises a compelling need to introduce innovative technology with the ambition of surpassing the performance ceiling set by conventional approaches. In this context, Machine Learning (ML) based systems emerge as viable contenders to tackle this challenge. This prompts an investigation into the SWOT analysis specifically tailored to ML-based embryo evaluation.

While ML-based systems hold the promise of substantial strengths and opportunities, they also bring along their own set of weaknesses and potential threats. The development of these systems necessitates a collaborative approach to research and development.

This process generates a "technology-push" through the creation of ML models, which aligns with the "demand-pull" to enhance traditional embryo selection procedures. This harmonious integration aspires to pave the way for effective and transparent medical systems.

The global evolution and continuous renovation of healthcare systems serve to attract attention and motivation towards the formation of collaborative groups. These groups collectively strive to overcome the challenges posed by the introduction of ML-based embryo evaluation. This collaborative effort not only addresses the technical aspects but also ensures ethical considerations and patient welfare remain at the forefront of this transformative journey. In essence, this approach signifies a concerted endeavor to leverage cutting-edge technology, foster innovation, and establish a new paradigm in reproductive healthcare.

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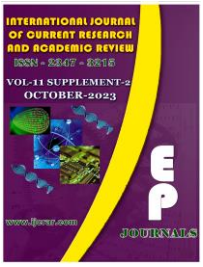

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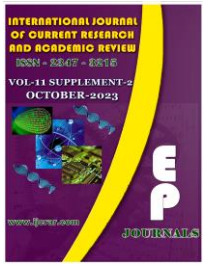

Full Length Article **IJCRAR/FL/12**

Isolation, Screening and Characterization of Biosurfactant Producing Bacteria from Marine Soil

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Abstract

Biosurfactants are the amphiphilic compounds which are excreted or produced at the microbial cell surface and reduces surface tension. Biosurfactants have many potential advantages such as high selectivity, biodegradability, biocompatibility, bioavailability, and ecological acceptability, increased effectiveness in extreme condition of temperature and salt concentrations. In the present study, Bio surfactant producing marine soil bacteria were isolated and characterised. 16 bacterial isolates were obtained from 5 different marine soil samples collected from Thiruvanmiyur, Ernavur, Besant Nagar, Neelankarai and Muttukadu. All the bacterial isolates were screened for biosurfactant production. Among the three preliminary tests (Growth of bacteria in marine broth with oil, drop collapse assay and haemolytic activity) only one isolate was found to be positive for all the three tests. The selected isolate was further tested for its biosurfactant production by oil displacement test and emulsification index. Biosurfactant was extracted from the bacteria and tested for antibacterial activity and biofilm inhibition. The Biosurfactant extract was found to have antibacterial activity against *Staphylococcus aureus* and no antibiofilm activity was observed for the tested crude biosurfactants. The presence of two compounds Pentadecanoic acid, and methyl ester in the marine bacterial extract by GC-MS analysis confirmed the presence of biosurfactants. GC-MS analysis revealed the presence of some important compounds like 2,3-dihydro-benzofuran and Phenol,2,4-bis (1,1-dimethylate) and Phytol which were reported to have antibacterial activity.

Keywords: Microbial-derived surfactants, amphipathic polysaccharides, lipopolysaccharides, wastewater treatment.

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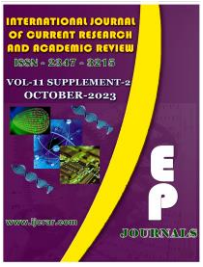

Introduction

Microbial-derived surfactants are those being naturally produced by microorganisms either constitutively or inducible. A biosurfactant is an amphiphilic molecule that can be classified into two different classes, low and high molecular weight biosurfactants. Low molecular weight biosurfactants are generally glycolipids, such as rhamnolipids or lipopeptides, whereas the high molecular weight biosurfactants encompass amphipathic polysaccharides, lipopolysaccharides, proteins, and lipoproteins. (Hamid *et al.,* 2018). Biosurfactants are successfully applied in microbial enhanced oil recovery, pharmaceutical products, cosmetics, wastewater treatment, and sludge treatment (Gebregiorgis *et al.,* 2021). Likewise, in the food industry, they can serve as an emulsifier in confectionery production or solubilizer in foods containing fats and oils, such as margarine and dairy foods (Hamid *et al.,* 2018). Due to their unique properties and vast array of application, identification of new biosurfactant producing microbes is in great demand (Thavasi *et al.,* 2011). Many oil-degrading bacteria isolated in crude oil-polluted soil or water has been reported to produce biosurfactants. Bacterial species such as *Pseudomonas aeruginosa*, *Mycobacterium* sp., *Arthrobacter* sp., *Bacillus*, *Alcaligenes*, *Pseudomonas* and *Corynebacterium* enhance petroleum oil degradation by producing biosurfactants. Therefore, these bacterial strains are extensively recommended for use to achieve a fast degradation of crude oil (Xu *et al.,* 2020).

Marine microbes that act as a potent source of various industrially important bioactive compounds include enzymes, exopolysaccharides (EPS), biosurfactants, antibacterial, antiviral, anticancer compounds etc. (Ayona Jayadev and Lekshmi, M., 2016).

In the present study, Bacteria were isolated from marine soil and screened for Biosurfactants and analysis of antibacterial activity and biofilm inhibition of Biosurfactant extract.

Materials and Methods

Sample collection

Marine soil samples were collected from Thiruvanmiyur, Ernavur, Besant Nagar, Neelankarai and Muttukadu. The samples were collected in sterile containers and were brought to the laboratory.

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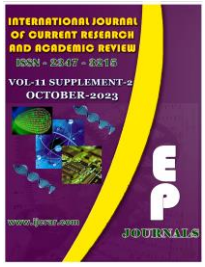

Isolation of bacterial colonies

1g of the soil sample was weighed. Isolation of bacteria was done by serial dilution and spread plate technique in marine nutrient broth. After incubation at 37^{o}C for 2days, single, separated colonies were selected and subcultures were maintained on marine medium until further use.

Screening of biosurfactant producing bacterial strains

Primary screening of biosurfactant producing bacterial strains was done following the method of Ayona Jayadev and Lekshmi (2016). The isolated bacterial strains were inoculated in 10ml of marine broth containing a drop of oil and incubated with continuous shaking (200 rpm) for one week at room temperature using a shaker. After that the growth of the bacterial strains were observed by measuring absorbance of the culture at 600 nm.

Drop collapse test

Jain *et al.,* (1991) developed the drop collapse assay. This assay relies on the destabilization of liquid droplets by surfactants. Therefore, drops of a cell suspension or of culture supernatant are placed on an oil coated, solid surface. If the liquid does not contain surfactants, the polar water molecules are repelled from the hydrophobic surface and the drops remain stable. If the liquid contains surfactants, the drops spread or even collapse because the force or interfacial tension between the liquid drop and the hydrophobic surface is reduced. The stability of drops is dependent on surfactant concentration and correlates with surface and interfacial tension. The drop collapse assay is rapid and easy to carry out, requires no specialized equipment and just a small volume of sample. In addition, it can be performed in microplates. This assay has been applied several times for screening purposes. But it displays a relative low sensitivity since a significant concentration of surface-active compounds must be present in order to cause a collapse of the aqueous drops on the oil or glass surfaces.

Hemolytic activity

Isolated bacterial strains were streaked on blood agar plates containing 5% sheep blood and incubated at room temperature for 24h. The plates were observed for clear zone around the bacterial colony.

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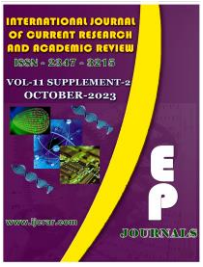

Emulsification test of biosurfactant extract

The selected isolated colony was suspended in test tube containing 2ml of marine nutrient broth. After 48h of incubation, 2ml hydrocarbon (oil) was added to the tube. Then, the mixture was vortexed at high speed for 1 min and allowed to stand for 24h. The emulsion index was calculated. It is the height of the emulsion layer (cm) divided by total height of the emulsion layer (cm), multiplied by 100. (Bodour *et al.,* 2004)

Emulsification index = (Height of the emulsion layer/Total height) x 100

Oil displacement test

In the oil spreading technique developed by Morikawa *et al.,* 30 ml of distilled water was poured in a Petri dish to which 1 ml of coconut/sesame oil was added to the center. 20 μl of the culture obtained from the bacterial broth was added on top of the oil layer. The Petri dishes were closely observed for a zone of displacement in the oil.

Biosurfactant extraction

The culture was inoculated in 30ml of optimized medium and incubated at room temperature for 7days in a shaking incubator at 120rpm. The cells were then removed by centrifugation at 5000rpm for 20 minutes. The supernatant was taken and the pH of the supernatant was adjusted to 2, using 2M HCl. Then equal volume of chloroform: methanol (2:1) was added. This mixture was shaken well for mixing and left overnight for evaporation. The white coloured sediment obtained was further used for the study (Nayarisseri *et al.,* 2018).

Dry weight of biosurfactants

Sterile petriplate was taken and the weight of the plate was measured. Then the biosurfactant extract from the marine isolate was added in the plate and dried in hot air oven at 100^{o}C for 30 minutes (Nayarisseri *et al.,* 2018). After drying, the dry weight of the biosurfactants was calculated by the following formula:

Dry weight of biosurfactants = (Weight of the plate after drying - weight of the empty plate)

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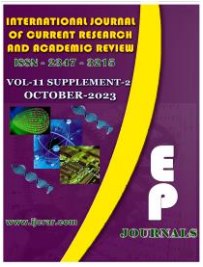

Antimicrobial activity

The antibacterial activity of biosurfactant extract was tested against *Staphylococcus aureus* on Mueller Hinton agar by agar well diffusion method (CLSI guidelines). 18 h old culture *Staphylococcus aureus* was lawned on Mueller Hinton agar. Using sterile cork-borer wells with 6 mm diameter was cut. 10mg of biosurfactant extract was used as stock.

The different volumes of biosurfactant extract with different concentrations such as 25µl (250µg), 50µl (500µg), 75µl (750µg), 100µl (1000µg) were added into separate wells. Chloramphenicol (25µg) was used as positive control. The plates were incubated at 37° C in a bacteriological incubator for 24 h. The antibacterial activity was determined by measuring the diameter of the zone of inhibition around the well using the antibiotic zone scale.

Screening of biosurfactant extract for antibiofilm activity by Microtitre plate assay

To evaluate the efficacy of the biosurfactant extract in interrupting biofilm formation, MTP assay was carried out accordingly by Christensen *et al.,* (1985) using 96 well-flat bottom polystyrene titre plates. Briefly, about 100 µl of sterile marine nutrient broth medium was filled in row C and D from columns 2-11. Columns, 1-2 receive 100 µl sample from 2000 µg/mL concentration. Column 2 was mixed well and about 100 µl was taken and added to the adjacent well 3 and subsequently mixed in the same manner up to well 10.

The wells 1-11 were added with 20 µl of 18 h old bacterial culture *klebseilla* (OD adjusted to 0.5) was added, after which 80 µl of fresh medium was added. Well, 12 received only 200 µl of sterile medium considered as sterility control. The sample and bacterial inoculated plate was incubated at 37 °C for 24 h. After incubation, the content in the wells was removed and washed with 0.2 mL of phosphate buffer saline (PBS) pH 7.2 to remove free-floating bacteria.

The adherence of sessile bacteria was fixed with sodium acetate (2%) and stained with crystal violet (0.1% w/v). Excessive stain was removed by deionized water wash and kept for drying. Further, dried plates were washed with 95% ethanol and optical density was determined using a

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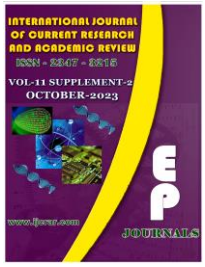

microtitre plate reader (Read-well Touch, Mumbai, India) at 600 nm. The percentage of biofilm inhibition was calculated using the below formulae:

$$\% \text{ Biofilm inhibition} = \frac{\text{Control OD - Test OD}}{\text{Control OD}} \times 100$$

Gas Chromatography

A Shimadzu GC-2010 Plus gas chromatograph was equipped with a straight deactivated 2 mm direct injector liner and a 15m Alltech EC-5 column (250µ I.D., 0.25µ film thickness). A split injection was used for sample introduction and the split ratio was set to 10:1. The oven temperature program was programmed to start at 35°C, hold for 2minutes, then ramp at 20°C per minute to 450°C and hold for 5 minutes. The helium carrier gas was set to 2 ml/minute flow rate (constant flow mode).

Mass Spectrometry

A Direct connection with capillary column metal quadupole mass filter prerod mass spectrometer operating in electron ionization (EI) mode with software GCMS solution ver. 2.6 was used for all analysis.

Low-resolution mass spectra were acquired at a resolving power of 1000 (20% height definition) and scanning from m/z 25 to m/z 1000 at 0.3 seconds per scan with a 0.2 second inter-scan delay. High resolution mass spectra were acquired at a resolving power of 5000 (20% height definition) and scanning the magnet from m/z 65 to m/z 1000 at 1 second per scan.

Mass spectrometry library search

Identification of the components of the compound was matching their recorded spectra with the data bank mass spectra of NIST library V 11 provided by the instruments software. GC/MS metabolomics Database was used for the similarity search with retention index.

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Results and Discussion

Collection of samples

Fig.1 Marine soil samples – S1, S2, S3, S4 and S5

Fig.2 Bacterial isolates from marine soil

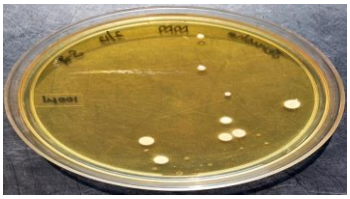

Fig.3 Pure culture of Marine bacterial Isolate

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Fig.4 Microtitre plate showing Drop collapse test for marine bacterial isolates

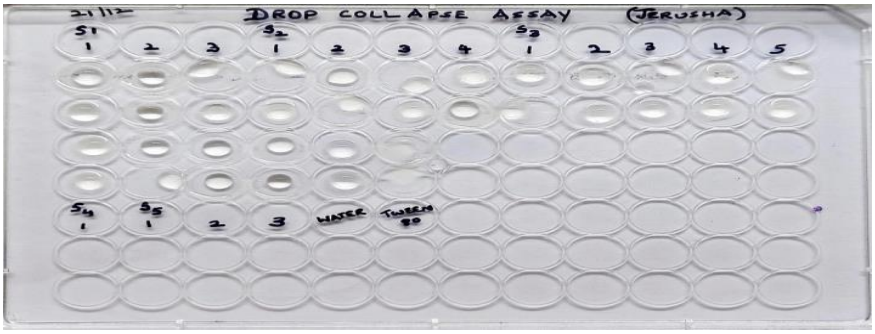

Fig.5 Blood agar Plate showing hemolysis

Fig.6 Emulsification index of the selected marine isolate

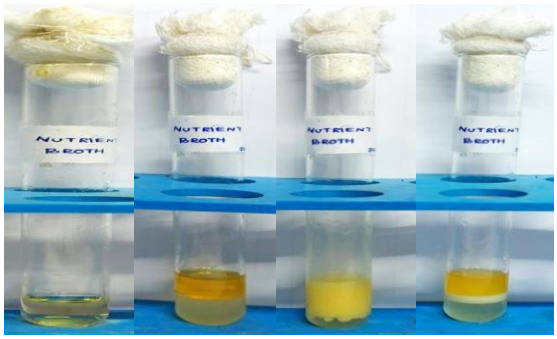

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Fig.7 Screening of Biosurfactant producing bacteria for Displacement of oil

Fig.8 Dried form of biosurfactant

Fig.9 Antibacterial activity of biosurfactant extract against *Staphylococcus aureus*

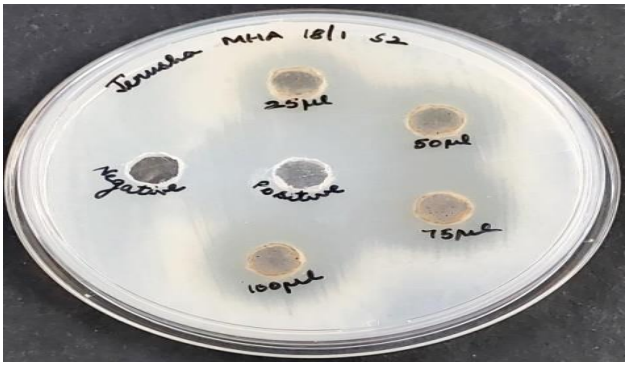

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Table.1 Showing antibacterial activity of biosurfactant extract against *Staphylococcus aureus*

S. No	Volume of Biosurfactant extract (µl)	Concentration of biosurfactant (µg)	Zone of inhibition in mm
1.	25	25	14
2.	50	50	16
3.	75	75	18
4.	100	100	18
5.	25 (Chloramphenicol - Positive Control)	25	23

Fig.10 Screening of biosurfactant for antibiofilm activity

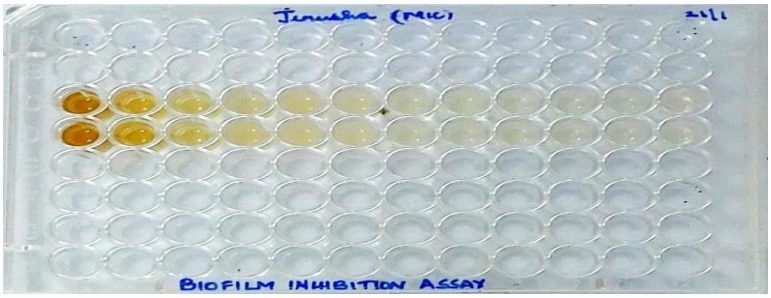
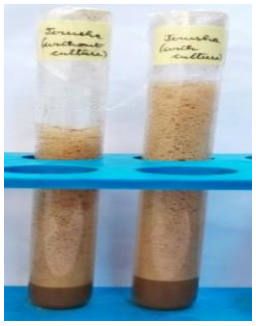


Fig.11 Screening of biosurfactant for antibiofilm activity Fig 11: Test tubes showing Foaming activity of Soap pod powder and Biosurfactant with Soap Pod powder (right side tube)



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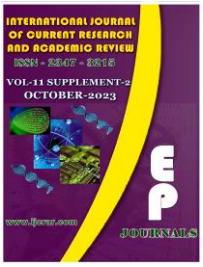

Discussion

A total of 16 bacterial isolates were obtained from 5 different marine water samples. All the bacterial isolates were screened for biosurfactants production. The primary screening of biosurfactant producing bacterial strains was done by inoculating all the isolated strains in marine broth added with oil. The growth of the strains after 7 days of incubation was measured in terms of OD taken at 600nm. Out of 16 bacterial isolates, 9 isolates showed growth in the medium added with oil. Strains B4, B6, B7, B8, B14, B15 and B16 did not show any growth. Dhail, 2012 reported that the strains possessing biosurfactant producing activity was identified by emulsion of oil and maximum growth.

Among the 16 bacterial strains, 11 strains showed positive for drop collapse test (Fig 4). Youssef *et al.,* 2004 stated that the result was considered positive for biosurfactant production when the drop was flat and those cultures that gave rounded drops were considered as negative for the test. Persson and Molin (1987) described a similar assay using a glass surface instead of the oil coated surface. Furthermore, Bodour and Miller-Maier (1998) showed that for pure surfactant, this assay can even be quantitative by measuring the drop size with a micrometer.

Among the 16 bacterial isolates, only 3 isolates produced β – haemolysis (Fig 5). Blood hemolysis has been chosen to be the preliminary screening method for biosurfactant production (Ghayyomi Jazeh *et al.,* 2012). Safary *et al.,* 2010 reported that while the other microbial products such as virulence factors lyse blood agar, the biosurfactants that are poorly diffusible will not lyse blood cells. However, hemolysis screening can be used as a rapid screening method, in which samples with the positive results are subsequently subjected to biosurfactant-activity tests.

Only one bacterial isolate showed positive for all the three preliminary tests was characterized for biosurfactant production. The oil displacement assay showed positive with a displaced zone for the selected isolate (Fig 7). Plaza *et al.,* and Youssef *et al.,* demonstrated that the oil spreading technique is a reliable method to detect biosurfactant production by diverse microorganisms.

The emulsification index of biosurfactant producing bacteria was determined as 32% (Fig 6) The Emulsification index determines the productivity of bioemulsifiers (Bonilla *et al.,* 2005). Thus, by

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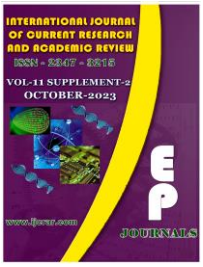

examining the emulsification units, it is possible to select a potent biosurfactant/bioemulsifier producer.

Biosurfactant was extracted from the selected isolate and tested for antibacterial activity against *Staphylococcus aureus* by Agar well diffusion method. Agar well diffusion method is widely used to evaluate the antimicrobial activity of plants or microbial extracts (Valgas *et al.,* 2007). 1 mg/ml of biosurfactant extract was used as stock in which 25µl, 50µl, 75µl and 100µl inhibited *Staphylococcus aureus* with a zone of inhibition diameter 14mm, 16mm, 18mm & 18mm.

Chloramphenicol was used as positive control with a zone of inhibition 23mm (Fig 9& Table 1). The antimicrobial effect of the biosurfactants is the adhering property of the biosurfactants to the cell surfaces caused deterioration in the integrity of cell membrane and breakdown in the nutrition cycle (Hingley *et al.,* 1986)

The Crystal violet assay was done to perform biofilm inhibition assay. Culture medium without/ biosurfactant was used as a positive control. One of the most used methods to assess the effectiveness of biosurfactants and biofilm inhibitory agents is the crystal violet quantification of biofilm growth (O'Toole, 2011).

The OD of stained adherent bacteria was determined with ELISA plate reader at wavelength of 550 nm. Increase in OD value was observed and there was no decrease in OD value at any concentration of biosurfactant extract. Higher OD values indicated an increased number of surviving bacterial strains in the biofilm formation (Mukherjee *et al.,* 2006). The crude biosurfactant extracted from the bacterial isolate showed no antibiofilm activity.

GCMS analysis helped in identifying 30 compounds that were present in the crude biosurfactant extracted from the bacteria. The presence of two compounds Pentadecanoic acid, and methyl ester in the marine bacterial extract confirmed the presence of biosurfactants. The important compounds like 2, 3-dihydro-benzofuran, Phenol,2,4-bis (1,1-dimethylate), Phytol and stigmast-5-en-3-ol, (3. Beta) were also present in the biosurfactant extract. As Phytols are used in shampoos, the crude biosurfactant extract was mixed with soap pod powder and tested for its foam formation. Increased foam formation was observed (Fig11) when compared with the soap pod powder mixed with water.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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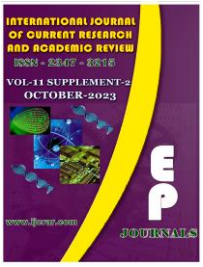

Conclusion

Biosurfactants usage has been increasing in various industrial sectors due to the growing demand for eco-friendly materials. Biosurfactants are recognised for their potential in the development of commercial products. The extracted biosurfactant from marine soil bacteria possess antibacterial activity against *Staphylococcus aureus*. GC-MS analysis of crude extract revealed the presence of some useful compounds like phytol which is used in cosmetics and shampoos and soaps and so a trial was attempted to use it with soap pod powder for foam formation. The compounds like 2,3-dihydro-benzofuran and Phenol,2,4-bis (1,1-dimethylate) were detected which were reported to possess antibacterial, antiviral, antifungal and anti-inflammatory activities. Further studies are required for the optimization of Biosurfactant production. Extraction and purification of specific compound in the crude biosurfactants produced by the marine bacterial isolate can be done for its medicinal or industrial applications.

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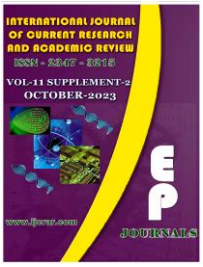

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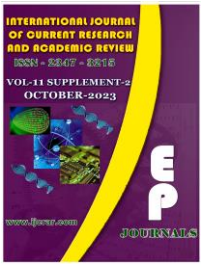

Full Length Article **IJCRAR/FL/13**

A Review on the Role of Actinomycetes in Green Synthesis of Nano Particles

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Abstract

Green synthesis aims to produce versatile nanomaterials with wide-ranging applications in fields such as diagnostics, medicine, imaging, and beyond. Within this context, the focus is on the crucial role of microbes, particularly Actinomycetes, which serve as effective factories for nanoparticle synthesis. Green synthesis stands out as the preferred method for minimizing chemical accumulations and emerges as the most cost-effective approach for large-scale nanoparticle production in industrial settings. Green synthesis of Nano particle is the timely need to overcome environmental pollution and a scope of energy conversion with the energy and components released during bioremediation process. This review spans the role of Microbes – Actinomycetes of interest that can be used as nanoparticle synthesizing factories. Green synthesis is the emerging era of Nano particle synthesis. Nano technology has taken a new path for synthesizing Nano particles which is eco-friendly, Energy conservative and sustainable process. Though it is termed as a New modern method of nano synthesis and Bio- Nano synthesis it is a proven fact that Indians have been using such formulations since 3rd millennium BCE Indus Valley civilization or earlier. Number of studies in the ayurvedic preparations like 'bhasmas' and siddha preparations like Chenduram, parpam, Chunnam, Kattu and Padhangam are lifesaving and miracle nanomedicines, which were prepared by the Siddhars. Green synthesis of Nano particles is the only process of choice to reduce the chemical accumulation. Green synthesis leads as the top economic approach for large scale synthesis of nanoparticle in industries.

Keywords: Microbes in green synthesis, Actinomycetes in Nano technology, Gold Nano particles.

EXCELLENT PUBLISHERS

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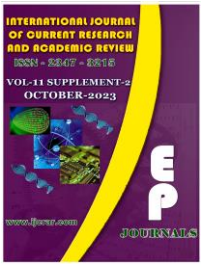

Introduction

Actinomycetes are a group of bacteria that are characterized by their unique growth pattern and appearance. They are named after their filamentous or thread-like (filamentous) growth and are often referred to as filamentous bacteria. Actinomycetes are a diverse group of microorganisms that play important roles in various ecological and industrial processes. They are a diverse group of filamentous bacteria with important roles in soil ecosystems, medicine, and industry.

Their ability to produce antibiotics and break down complex organic compounds has made them valuable in various fields of science and technology. Actinomycetes have been studied for their potential role in the synthesis of nanoparticles, including metallic nanoparticles like silver, gold, and others. The synthesis of nanoparticles by actinomycetes involves their unique metabolic processes and the reduction of metal ions to form nanoparticles. Actinomycetes are capable of synthesizing intracellular and extracellular nanoparticles. Intracellular synthesis occurs on the surface of the mycelia due to the electrostatic binding of metallic ions to the negatively charged carboxylate groups in the enzyme present on the cell wall of mycelia.

Synthesis process protocol involves Isolation of Actinomycetes from a suitable environment, Culturing the isolated Actinomycetes, Adding Metal precursors and Structural elucidations of obtained NPs.

Isolation of Actinomycetes

Actinomycetes can be isolated from various environmental sources, such as soil, water, and sediments. Once isolated, a specific strain of actinomycetes is selected for nanoparticle synthesis based on its suitability and capability for this purpose.

Inoculum Development

The selected actinomycete strain is cultured in a suitable growth medium. The medium composition can be optimized to enhance nanoparticle synthesis, typically by providing a carbon source, nitrogen source, and metal precursor.

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International Journal of Current Research and Academic Review

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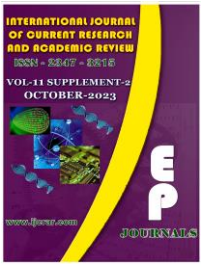

Precursor for Nanosynthesis

A soluble metal salt (metal precursor) is added to the culture medium. Commonly used metal salts include silver nitrate (AgNO3), gold chloride (HAuCl4), and others, depending on the desired nanoparticle type.

Actinomycetes have the ability to reduce metal ions to their elemental form. This reduction process is often facilitated by the metabolic activities of the microorganism. The reduced metal ions nucleate and grow into nanoparticles. Some actinomycetes may also secrete extracellular enzymes or biomolecules that act as reducing and capping agents, helping to stabilize the nanoparticles.

The advantage of using actinomycetes for nanoparticle synthesis lies in their ability to carry out the reduction process under mild conditions and often without the need for toxic chemicals. This environmentally friendly approach has gained interest in green nanotechnology. It's worth noting that research in this area is ongoing, and scientists continue to explore the potential of actinomycetes for nanoparticle synthesis and their practical applications. It's worth noting that research in this area is ongoing, and scientists continue to explore the potential of actinomycetes for nanoparticle synthesis and their practical applications.

The synthesis of nanoparticles by actinomycetes involves their unique metabolic processes and their ability to reduce metal ions to form nanoparticles. Actinomycetes, such as Streptomyces species, have gained attention for their potential in green and eco-friendly nanoparticle synthesis. ISP-2 is a rich medium that is routinely used for cultivating *Streptomyces lydicus* along with various other plant root associated strains.

Process Protocol (For GNPs)

- Isolation of Actinomycetes in ISP-2
- Cultivation of pure isolate in ISP-2 Broth (5 days)
- Extraction of supernatant by Centrifugation at 8000rpm 10 min 4˚C
- 3 ml of the supernatant was added to the 7 ml of 1 mM Hydrogen tetrachloroaurate (III) ($HAuCl_4 \cdot 3H_2O$) and incubated at 37 °C for 24 h.

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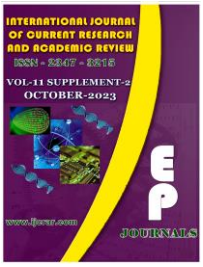

- Extraction of the NPs and Characterization.
- A few of the genera have been reported for the biosynthesis and characterization of gold nanoparticles like Thermomonospora, *Nocardia*, Streptomyces and *Rhodococcus*.

Nanoparticles formed by Actinomycetes

Streptomyces griseoruber produces gold nanoparticles with a size ranging from 5 to 50 nm, and these nanoparticles are known for their antilipid peroxidation activity.

Streptomyces hirsutus strain SNPGA-8 synthesizes silver nanoparticles in the size range of 18-39 nm, which exhibit antimicrobial properties.

Streptomyces coelicolor is capable of producing silver nanoparticles with a size of less than 60-70 nm. These nanoparticles have shown antibacterial and antifungal activity, including anti-MRSA (Methicillin-resistant *Staphylococcus aureus*)

Rhodococcus sp is capable of synthesizing gold nanoparticles with a size less than 9 nanometers. These nanoparticles have applications in antifungal treatments, catalysis, and the synthesis of coatings for electronic applications.

Streptomyces hygroscopicus generates both gold and zinc nanoparticles, which are spherical in shape and have applications in antibacterial nanopackaging.

Applications of Nanoparticles

Nanoparticles, which are typically particles with dimensions ranging from 1 to 100 nanometers, have a wide range of applications across various fields due to their unique properties.

Medicine and Health Care

Drug Delivery

Nanoparticles can encapsulate drugs and deliver them to specific targets in the body, improving drug efficacy and reducing side effects.

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Cancer Therapy

Nanoparticles can be designed to target and destroy cancer cells selectively, known as targeted therapy.

Imaging

Nanoparticles can enhance medical imaging techniques like MRI and CT scans, making it easier to detect diseases.

Diagnostic Tools

They are used in diagnostic tests, such as nanoparticle-based assays for detecting biomarkers or pathogens.

Electronics

Nanoparticles are used in the production of smaller and more efficient electronic components as semiconductors

Quantum dots, a type of nanoparticle, have applications in high-definition displays and solar cells.

Nanoparticles can improve the efficiency of solar cells by enhancing light absorption and electron transport.

Nanoparticles can be used to enhance the capacity and performance of batteries.

Nanoparticles can act as highly effective catalysts in chemical reactions, speeding up processes in industries like petrochemicals and pharmaceuticals.

Bioremediation

Nanoparticles are used to remove pollutants from water, such as heavy metals and organic contaminants.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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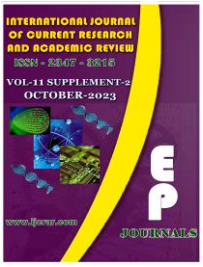

Nanoparticles can improve the efficiency of air filtration systems, capturing smaller particles and pollutants.

Material Sciences

Adding nanoparticles to materials like polymers and ceramics can enhance their mechanical, electrical, and thermal properties.

Nanoparticle-based coatings can provide properties like scratch resistance, UV protection, and anti-corrosion.

Nanoparticles can be incorporated into packaging materials to extend the shelf life of products and monitor freshness.

Nanoparticles can deliver pesticides more efficiently and reduce their environmental impact. Nanoparticles can be used to make textiles water-repellent and stain-resistant.

Silver nanoparticles, for example, can be used to create antimicrobial textiles.

Cosmetics

Sun screen lotions-Nanoparticles like zinc oxide and titanium dioxide are used in sunscreens for UV protection without the white residue.

Technology

Nanoparticles play a crucial role in nanotechnology research, enabling the development of new materials and technologies.

Defence

Nanoparticles are used in advanced materials for aircraft and spacecraft, as well as in sensor technologies and protective coatings.

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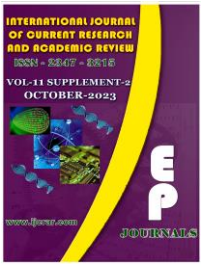

Conclusion

It's important to note that while nanoparticles offer many benefits, there are also concerns about their potential environmental and health impacts, which continue to be areas of active research and regulation. Proper handling and disposal of nanoparticles are essential to minimize any adverse effects.

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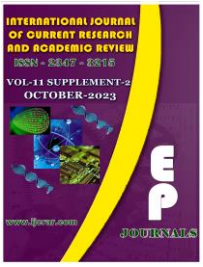

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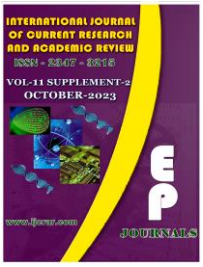

Full Length Article **IJCRAR/FL/14**

Phytochemical Analysis and Comparison of Anti-Fungal activity against Dandruff Causing Organism Using Plantextracts and Anti-Dandruff Shampoos

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Abstract

With dandruff being a common everyday problem, many anti-dandruff shampoos and lotions are marketed to combat dandruff. Though synthetic drugs are available in today's market, there is a need for new products of natural origin like phytoconstituents. Spices like cardamon, fennel, star anise, clove etc. are the natural constituents which have high anti-fungal properties. The present study deals with testing the effect of different synthetic and herbal shampoos on dandruff causing fungus isolate from Malassezia species by Agar cup method, to determine its Minimum Inhibitory Concentration (MIC) and to perform the phytochemical screening of crude plant extracts to assess the presence of secondary metabolites.

Keywords: Anti-dandruff activity, Malassezia, Herbal shampoo, Bioactive compounds.

Introduction

Scalp is unique among skin areas in human. It is characterised by thick skin layer with high follicular density and abundant sebaceous glands. The pH of scalp is 5.5 and that of hair shaft is 3.67. The presence of sebaceous glands along with the dark and warm environment make it more prone to dandruff. Non-inflammatory condition of the scalp is characterized by excess scaling of

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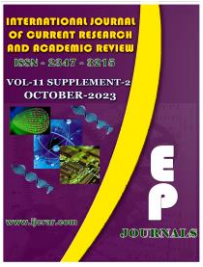

scalp tissue. Mycotic infection of the skin by the dermatophytes may be categorized into superficial and deep fungal infections. *Malassezia furfur (Pityrosporum ovale)*, a lipophilic fungus, affects the hair and causes diseases called dandruff and also called pityriasis versicolar, tinea circinata, seborrheic dermatitis [1]. Dandruff is a condition, which causes small white flakes of skin that separate and fall from the scalp. People who suffer from dandruff have over active sebaceous glands, which make their scalp oily. It has been investigated and reported that there was no complete cure for this disease. Malassezia proliferates on the scalp with excess sebum production, this is due to environmental changes, hormonal changes, stress. Due to the proliferation of the fungus, itching of the scalp and loss of hair follicules occur [2]. *Malassezia* belongs to the division Basidiomycota under the class Exobasidiomycetes and order Malasseziales. Dandruff is reliant on 3 factors that favours its survival and reproduction such as, sebum production, microbial metabolism and susceptibility.

Materials and Methods

This research was initiated to investigate the potential benefits of various plant extracts at different concentrations for dandruff management. Samples were acquired from infected scalps utilizing sterile combs and were subsequently cultured on SDA medium enriched with chloramphenicol and olive oil at 30°C for a week. After successfully isolating the organism, it was further incubated on SDA medium to facilitate subsequent processes. The fungi were identified using Lactophenol Cotton Blue staining. Additionally, biochemical tests like gelatin hydrolysis, catalase test, carbohydrate fermentation, and Tween utilization were executed to aid in accurate fungal identification. Plant materials, procured from a local drug store, underwent a meticulous cleaning process and were then sun-dried. They were ground to a fine powder and subsequently mixed with methanol for 24 hours. The resulting crude extract was then filtered and stored.

To ascertain the potency of these plant extracts against dandruff- causing fungi, the Agar Cup Method was employed. SDA media was prepared, and a 24-hour test culture was swabbed across it. Plant extracts and anti-dandruff shampoos were introduced, and zones of inhibition were measured post incubation. Additionally, the minimum inhibitory concentration (MIC) was determined on Potato Dextrose Agar media using varying dilutions.

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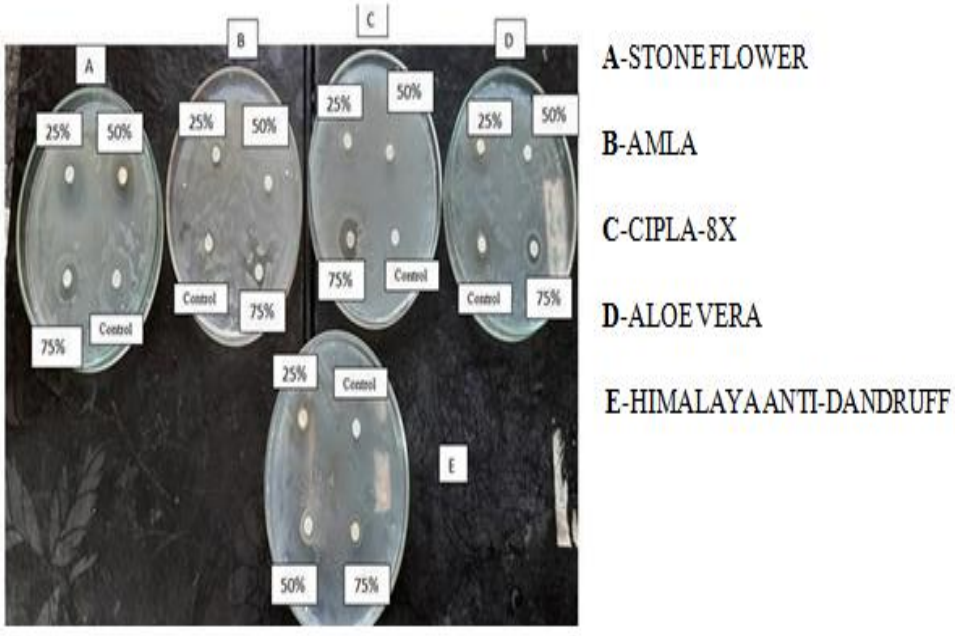
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Fig.1 Minimum Inhibitory Concentration (MIC)



Quantitative Phytochemical Screening

1. Test for Tannins

1ml of the extract was added with 5ml of distilled water and kept in boiling water bath. After boiling, sample was cooled and two to four drops of 0.1% ferric chloride solution was added. Appearance of brownish green or blue-black colouration confirms the presence of tannins.

2. Test for Phlobatanins

1% of hydrochloric acid was added to 1ml of extract and boiled in hot water bath. Formation of red precipitate indicates the presence of phlobatanins.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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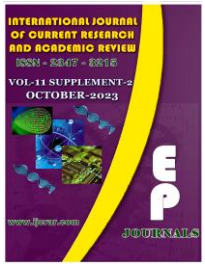

3. Test for Saponins

1ml of the extract was taken in a test tube and 2ml of distilled water was added to it. The test tube was kept in boiling water bath and was shaken vigorously. Existence of froth formation, persisted for 1 hour confirms the presence of saponins.

4. Test for Flavanoids

1ml of the extract was taken in a test tube and few drops of diluted sodium hydroxide was added to the extract and kept at room temperature. Formation of yellow colour indicates the presence of flavanoids.

5. Test for Alkaloids

To 0.5ml of the extract, few drops of 0.1% picric acid were added. Formation of yellow indicates the presence of alkaloids.

6. Test for Terpenoids

To 5ml of extract 2 ml of chloroform was added, followed by the addition of 3ml of concentrated sulphuric acid. Formation of reddish-brown layer at the junction of the two solutions confirms the presence of terpenoids.

7. Test for Phenol (Ferric Chloride Test)

To 0.5ml of the extract was added with few drops of neutral ferric chloride (0.5%) solution was added. Formation of dark green colour indicates the presence of the phenolic compounds.

Results and Discussion

Identification of the Sample

This study was focused on the anti-fungal activity of medicinal plants against the test culture. The biochemical characterization was shown in the Table – 1.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

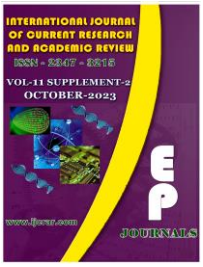

Table.1 Biochemical Characterization

S.No	Characters	Results
1.	LPCB staining	Cells have a bottle-like shape at the end of each cell (sphagetti and meatballs appearance)
2.	Gelatin hydrolysis	Partial liquefaction of the inoculated tube
3.	Carbohydrate fermentation	Dextrose and Xylose produced acid and gas production
4.	Tween-20,40,80 utilization	Growth of lipophilic yeast around the wells
5.	Catalase test	Formation of gas bubbles

Anti-Fungal Activity

The anti-fungal activity of medicinal plants was analysed against the test culture. The inhibitory activities of the medicinal plants against the *Malassezia* species were observed and the zone of inhibition (mm) was measured and given in Table-2. From the above anti-fungal activity, it was found that the more zone of inhibition was shown by stone flower (27mm) and the other medicinal plants have also shown good anti-fungal activity against the test culture. It is concluded that we can use Stone flower, Aloe vera, Amla, Clove and Cinnamon against Dandruff causing organism since it is cheap and effective.

Table.2 Antifungal activity using medicinal plants against dandruff

Medicinal Plants And Anti- Dandruff Shampoo Extract	Concentration of the extract (zone of inhibition)
	100% Concentration
Aloe vera	25mm
Amla	25mm
Cardamom	13mm
Fennel	16mm
Clove	21mm
Star anise	19mm
Cinnamon	20mm
Cipla 8X	25mm
Himalaya anti-dandruff	10mm
Head and shoulders	22mm

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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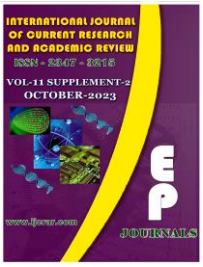

To comprehend the active constituents within the plant extracts, quantitative phytochemical screening was undertaken.

Formulation of Herbal Shampoo

For the herbal shampoo formulation [4], the extract was prepared using 100 gm each of Hibiscus flower [5], Amla [6], Soapnut [7], Bhringraj, Aloe vera, and Cassia, all sourced from a local country drug store. The materials were thoroughly washed using double-distilled water and subsequently dried for a few hours. Once dried, they were ground into a fine powder using a mortar and pestle. This powdered mix was then boiled in distilled water for about 45 minutes at a low heat setting. After boiling, the extracts from each plant material were individually separated using a muslin cloth. This extract formed the base for the shampoo. To formulate the herbal shampoo, a 10% gelatin solution was introduced to the prepared extract. The combination was mixed continuously at 20-minute intervals. Additionally, 1 ml of lemon juice extract [8] was stirred into the mix. For fragrance, rose oil was added. The final volume of the shampoo was adjusted to 100 ml using the gelatin solution, ensuring the shampoo attained an opaque consistency.

Conclusion

This study presents a number of plant drugs with proven efficacy as in hair care preparations. Herbs are compatible to both human skin and hair. Unlike chemical based products, herbs are completely safe and extremely effective and have no negative side effects. They are cost effective. This study was carried out with an aim of preparing a herbal shampoo that reduces hair loss and to strengthen the hair growth. Herbal shampoo was formulated with the aqueous extracts of medicinal plants that are commonly used for cleansing hair traditionally.

Herbal shampoos do not provoke any allergic reactions. They help in the skin cells turn over and desquamation. To get rid of this problem, large sum of money is spent every year on synthetic shampoos and other agents worldwide. A basic knowledge of knowing can be used in policy making process for sustainable management of these helpful hair care plants leading to the conservation of the country's biodiversity.

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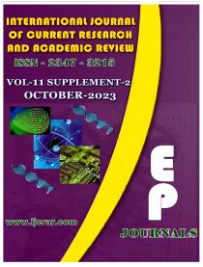

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EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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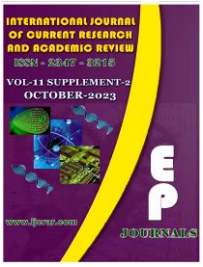
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Full Length Article **IJCRAR/FL/15**

An Overview of the Rise of Quantum Internet

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Abstract

The advent of quantum computing has ushered in a new era in the field of information security and communication. Traditional cryptographic methods, which rely on the difficulty of certain mathematical problems, are poised to become vulnerable to quantum attacks. In response to this impending threat, researchers and engineers have been diligently developing the framework for what promises to be the next revolutionary leap in technology. The objective of this paper provides a comprehensive overview of the emergence of the Quantum Internet, remote quantum communication and quantum mechanics background.

Keywords: Qubit, hop-by-hop, Teleportation, entangled stage, QPUs.

Introduction

A quantum internet is a quantum-information-processing network (Fig. 1) in which quantum-information-processing nodes (such as quantum computers and quantum memories) are connected by quantum communication channels (such as optical fibers and free space). It enables arbitrary clients around the globe to achieve various quantum-information-processing tasks beyond those served by the current internet [1].

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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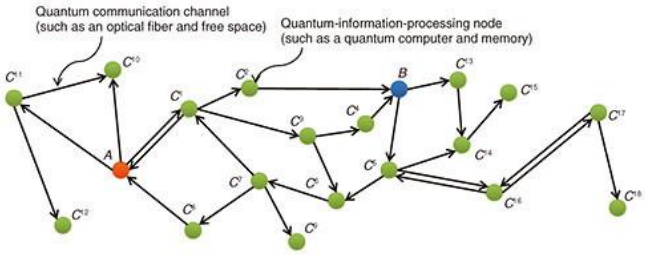
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Fig.1 Schematic of a quantum network.



Quantum information brings new opportunities and challenges to many technical fields, especially in secure communications. In traditional communications, the security of information is guaranteed by encryption algorithms with the hypothesis that they are too complex to be compromised [2]. Nowadays, after over twenty years of pure science phase, the research on quantum computing is finally reaching the engineering phase, getting out of the labs and into business reality. In fact, the development of quantum computers is experiencing a major boost, since tech giants entered the quantum race. In November 2017 IBM built and tested a 50-qubits processor [3].

Remote Quantum Communication

Remote quantum communication provides a promising building block for quantum internet. However, qubit, the basic unit of quantum information, follows the principle of no-cloning theorem, which leads to the fact that a standard technology of signal amplification cannot be used in quantum communication. Hence, the challenge of how to implement remote quantum communication needs to be overcome first before designing quantum internet architecture. Remote end-to-end quantum communication cannot be achieved by means of hop-by-hop forwarding.

In classic networks, the transmission of packet is generally realized by the store-and-forward scheme [4], which means that packets sent from the source host are stored and processed by all router nodes on the transmission path till they reach the destination host. The most intuitive method of implementing long-distance end-to-end quantum communication is direct hop-by-hop

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

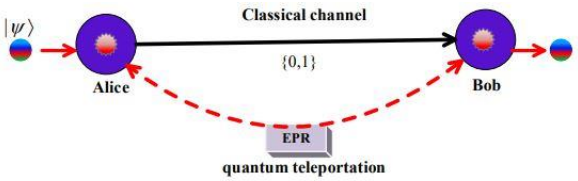
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

forwarding. In this way, qubits sent from the sender are stored and forwarded down the link toward a neighboring quantum node till the end of the connection (i.e., destination).

Note that the drawback of hop-by-hop forwarding is that this method places the valuable qubit at the inevitable risk of signal loss since multiple transport and access operations in quantum memory increase the probability that quantum state drifts from its assigned value. Therefore, a direct hop-by-hop forwarding way is not an ideal choice for remote end-to-end qubit transmission.

The properties of quantum mechanics provide new solutions to the transmission of qubit. Remote quantum communication is limited by the effects of photon loss and DE coherence inherent in transport media. However, the phenomena in quantum physics, with no counterpart in classic networks, compel researchers to seek innovative ways to transmit qubits. Teleportation [5]–a typical entanglement-based qubit transmission technology that can make qubits free from channel noise–is shown in Figure 2.

Fig.2 Teleportation. The local measurement operations and classical communication (LOCC) are performed between two communicating parties to teleport qubit.



Alice and Bob share a pair of entangled states, i.e., they are entangled. First, Alice jointly measures the qubit to be transmitted and the entangled state that she owns, and then Alice informs Bob the measurement result through a classical channel. According to the result, Bob performs unitary operations to obtain the qubit.

Therefore, an improved method compared with hop-by-hop forwarding is to establish entanglement over each quantum link and teleport qubit hop-by hop. However, considering the

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International Journal of Current Research and Academic Review

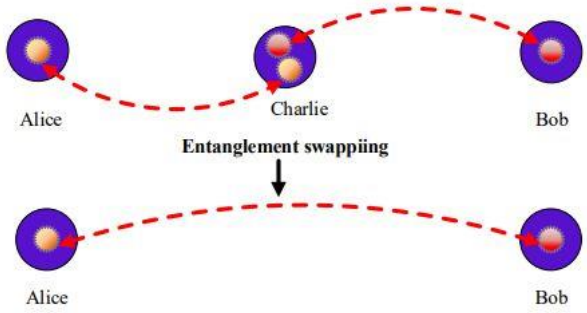
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

attenuation of quantum fidelity per hop, hop-by-hop teleportation still leads to a high bit error rate. An alternative to the hop-by-hop transmission of qubit is end-to-end teleportation, and it can effectively reduce the influence of channel and memory noise on the qubit. The precondition of end-to-end teleportation is that two communicating parties are entangled. However, two distant nodes cannot directly share a pair of entangled states distributed by the same light source due to photon loss. As a result, the challenge of end-to-end teleportation is how to convert link-level entanglements into long-distance end-to-end entanglement. Quantum repeaters play an important role in overcoming the challenge by performing entanglement swapping on the link-level entanglements [6–9]. As shown in Figure 3, Alice and Bob pre-share a pair of entangled states with Charlie respectively.

Fig.3 Entanglement swapping. Two short-distance entanglements can be extended to a remote entanglement between Alice and Bob by performing the LOCC operation on two un-entangled states that Charlie stores.



And a joint measurement is performed on the two entangled states that Charlie stores. As a result, Alice and Bob established a new entanglement system. Hence, any pair of quantum end nodes that are non-entangled can establish entanglement via hop-by-hop entanglement swapping, and then end-to-end teleportation can be performed to teleport qubits.

A quantum internet needs to support both long distance and parallel quantum communication, and quantum memory [10, 11] is an indispensable part to achieve these goals. For remote quantum communication, a pair of entangled states cannot be reused after the LOCC operation

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International Journal of Current Research and Academic Review

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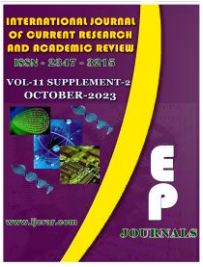
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



and can only be used to teleport one qubit. Hence, a sender generally needs to establish sufficient entanglements with a receiver to teleport numerous qubits. Quantum memory can realize the storage of quantum states. With the help of quantum memory, therefore, long distance and parallel quantum communication can be realized.

In general, the quantum communication model describing long-distance and parallel end to-end qubit transmission is shown in Figure 3. Each quantum node can equip with two types of quantum memory, i.e., entanglement memory and qubits queue. Each pair of entangled states distributed by light source can be used directly or stored in entanglement memory, and entangled states are used to implement entanglement swapping or teleportation.

Besides, the qubits waiting to be transmitted are stored in the queue. If there is a pair of shared entangled states in entanglement memory between the sender and receiver (end-to-end entanglement has been established), the qubit can be teleported from the sender to the receiver by performing teleportation.

Distributed Quantum Computing

Distributed quantum computing problems and quantum protocols have been well-studied for over two decades, from a theoretical computer science perspective, many of which have their inspiration from classical distributed computing research. Quantum versions of classical distributed computing problems and protocols, and new forms of distributed computing using quantum information, have been explored, e.g., the distributed three-party product problem, the distributed Deutsch-Jozsa promise problem and the distributed intersection problem, demonstrating how, for some problems, quantum information can enable fewer bits of communication to be used for a solution, and how certain distributed computation problems can be solved with quantum information, but cannot be solved classically.

Many quantum protocols, including quantum coin flipping, quantum leader election, quantum anonymous broadcasting, quantum voting, quantum Byzantine Generals, quantum secret sharing, and quantum oblivious transfer, can be viewed as "quantum versions" of classical distributed computing problems, and have been studied extensively.

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International Journal of Current Research and Academic Review

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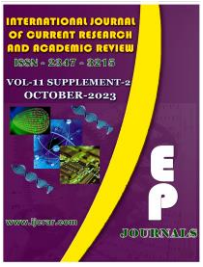
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Another area of study, which has also been considered as distributed quantum computing, is non-local gates, or the non-local control of quantum gates, including early work nearly over two decades ago. Key to performing such non-local control of quantum gates is the use of entanglement, which can be viewed as a resource for such non-local computations. More recent work has looked at how to partition the computations of distributed quantum circuits over multiple QPUs, e.g., as we mentioned earlier-with considerations including distributing computations in such a way as to optimize performance and to reduce the requirements on entanglement, since if the entanglements required are generated at too low a rate, this will hold up computations. The key motivation here is to inter-link a set of quantum computers to form effectively a much more powerful quantum computer [12].

Quantum Mechanics Background

We briefly review some quantum mechanics postulates and principles needed to understand the challenges behind the design of a quantum network. A quantum bit, or qubit, describes a discrete two-level quantum state, which can assume two (orthogonal) basis states: the zero (or ground state) and the one (or excited state), usually denoted as $|0\rangle$ and $|1\rangle$. As instance, if we represent the state of a photon with a qubit, the two basis states represent the horizontal and the vertical polarization of the photon, respectively.

Superposition Principle

As widely known, a classical bit encodes one of two mutually exclusive states, being in only one state at any time. Conversely, a qubit can be in a superposition of the two basis states at a certain time. As an example, a photon with 45° degrees of polarization is described by a superposed qubit, with an even amount of zero and one, being simultaneously horizontally and vertically polarized. Hence, while n classical bits can encode only one of 2^n possible states at a certain time, n qubits can simultaneously encode all the 2^n possible states at once, thanks to the superposition principle.

Quantum Measurement

According to one of the quantum mechanics postulates, whenever a measurement can have more than one outcome, as is the case for the two possible states of a qubit, after the measurement the

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

original quantum state collapses in the measured state. Hence, the measurement alters irreversibly the original qubit state [13]. And, the result of such a measurement is probabilistic, since one obtains either the state zero or the state one, with a probability depending on the amount of zero and one in the original superposed quantum state.

For instance, if the outcome of measuring a superposed qubit corresponds to the state zero, the qubit collapses into such a state and any further measurement will give zero as outcome, independently of the original amount of one in the superposed state. As a consequence, by measuring a qubit only one bit of information can be obtained.

No-cloning theorem

The no-cloning theorem states that an unknown qubit cannot be cloned, and it is a direct consequence of the quantum mechanics laws. Specifically, Nature does not allow arbitrary transformations of a quantum system. Nature forces these transformations to be unitary.

The linearity of unitary transformations alone implies the no-cloning theorem [13], which has critical consequences from a communication engineering perspective. In fact, classical communication functionalities are based on the assumption to be able to safely copy the information. This in turn deeply affects the quantum network design, as pointed out in Sec. IV.

Entanglement

The deepest difference between classical and quantum mechanics lays in the concept of quantum entanglement, a sort of correlation with no counterpart in the classical world. In a nutshell, the entanglement is a special case of superposition of multiple qubits where the overall quantum state cannot be described in terms (or as a tensor product) of the quantum states of the single qubits. To better understand the entanglement concept, let us consider Figure 4, showing a couple of maximally entangled qubits, known as EPR pair.

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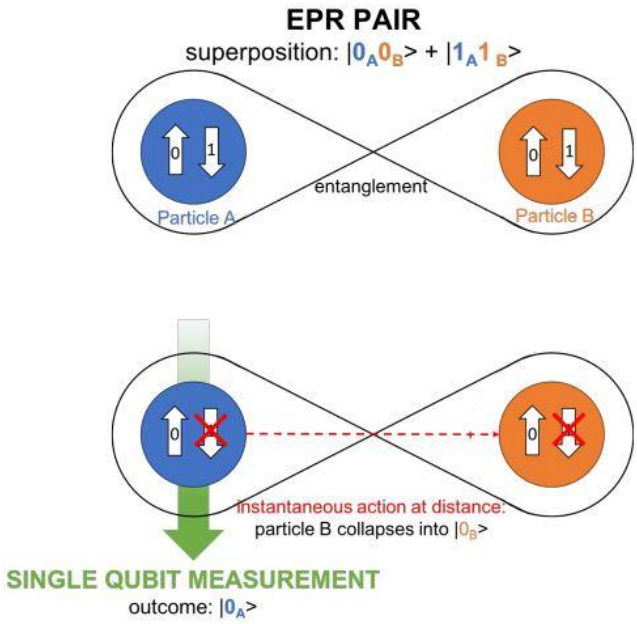
International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Fig.4 Quantum Entanglement: measuring one qubit of an EPR pair instantaneously changes the status of the second qubit, regardless of the distance dividing the two qubits. Specifically, the two particles forming the EPR pair are in superposed state, with an even amount of zero and one. Hence, by measuring one of the two qubits, we obtain either zero or one with even probability. But once the qubit is measured, say particle A with outcome corresponding to state zero, the second qubit instantaneously collapses into state zero as well.



The couple of qubits forming the EPR pair are in a superposed state, with an even amount of zero and one. By measuring each of the two qubits independently, one obtains a random distribution of zero and one outcomes with equal probability. However, if the results of the two independent measurements are compared, one observes that every time that the measurement of qubit A yielded zero so did the measurement of qubit B, and the same happened with the outcome one.

Indeed, according to quantum mechanics, as soon as one of the two qubits is measured the state of the other is instantaneously fixed. This quantum entanglement behavior induced Einstein and

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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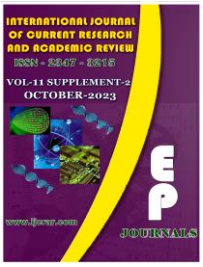

his colleagues to the so-called EPR paradox: the measurement of one qubit instantaneously changes the state of the second qubit, regardless of the distance dividing the two qubits. This seems to involve information being transmitted faster than light, violating so the Relativity Theory. But the paradox is illusory, as discussed in Sec. III.

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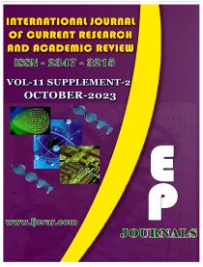

Full Length Article **IJCRAR/FL/16**

Graph Theory in Communication and Information Technology

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Abstract

Science is defined as any systematic and empirical activity that enhances the physical world knowledge, which produces the same result under different conditions technology can be defined as that activity which makes productive use of knowledgeGraph theory plays a fundamental role in science and technology across various domains. It provides a mathematical framework for modeling and analyzing relationships, connections, and networks, making it a versatile tool for understanding complex systems. Graph theory plays a significant role in communication and information technology (ICT) in various ways. It provides a mathematical framework for modeling and analyzing the structure, connectivity, and relationships within networks, systems, and data.

Keywords: Graph theory, communication and information technology.

Introduction

Graph theory

Graph theory is a mathematical structures used to model pair wise relationships between objects. Graphs are composed of vertices (or nodes) and edges, which connect pairs of vertices. These vertices and edges can represent a wide range of real-world phenomena and relationships

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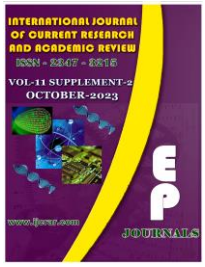

Communication and information technology

Communication and Information Technology (often abbreviated as CIT or ICT for "Information and Communication Technology") refers to the technologies used for gathering, storing, transmitting, and managing information. These technologies facilitate human communication, data processing, and the dissemination of information across various channels and formats. Primary components and aspects of Communication and Information Technology:

1. Communication Technologies

Telecommunication

Includes traditional landline telephony, mobile communication (cellular networks), satellite communication, and voice over internet protocol (VoIP).

Broadcasting

Refers to radio, television, and newer internet-based broadcasting services.

Internet Services

Encompasses services like email, instant messaging, video conferencing, and other online communication platforms.

Wireless Networks

This includes Wi-Fi, Bluetooth, NFC (Near Field Communication), and other wireless communication technologies.

2. Information Technologies

Hardware

Physical devices like computers, servers, networking equipment, and storage devices.

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Software

Operating systems, databases, applications, and other essential software tools.

Data Storage

Technologies related to data storage solutions, such as traditional hard drives, SSDs, cloud storage, and newer distributed storage systems like blockchain.

Databases

Systems designed to store, retrieve, and manage vast amounts of data efficiently, such as SQL databases (MySQL, PostgreSQL) and NoSQL databases (MongoDB, Cassandra).

3. **Networking**

Technologies and protocols that allow devices to connect and communicate, forming local area networks (LANs), wide area networks (WANs), and the broader internet.

4. **Cloud Computing**

Services that offer computing power, storage, and software solutions over the internet, eliminating the need for users to own and maintain physical infrastructure.

5. **Digital Media**

The digitization of content like text, images, video, and audio, which can be easily stored, processed, and transmitted by electronic devices.

6. **Cybersecurity**

Technologies, processes, and practices designed to protect systems, networks, and data from theft, damage, or unauthorized access.

EXCELLENT PUBLISHERS

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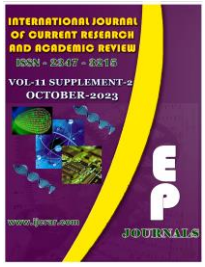

7. Web Technologies

Tools and platforms used for creating, hosting, and optimizing websites and web applications, including web servers, web design software, and web development frameworks.

Table.1

MERITS	DEMERITS
It makes human life SIMPLIER, with the invention of AI people are making lesser mistakes and it save time and effort and provides quality outcomes and life with higher production	It affects THE ENVIRONMENT the Advanced transportation results in AIR POLLUTION. Adaptation of automatic machineries it improves production but PEOPLE ARE LOSING THEIR JOBS
In MEDICAL SCIENCE, technology brought a revolution through discovery of various medical or surgical equipments, medicines and procedures which are helping in EXTENDING TE LIFE SPAN OF HUMAN BEINGS and saving many lives. It brings REVOLUTION IN COMMUNICATION system communicating through phones and emails with the help of internet, satellites -based communication very useful for us.	Machines may seem inexpensive and good to use but require lots of maintenances, which ultimately make them expensive. Our healthiness is also being affected by technology, thereby CAUSING EYE DIESEASE, ENHANCED BODY WEIGHT AND CANCER DUE TO SPECIFIC RADIATION TECHNOLOGY.Increased in the issues of INTERNAL SECURITY AND TERRORIST THREAD.
The events broadcast across the globe have eased with the help of TVs and SATELLITE RADIOS.	People are also facing privacy issues like EMAIL HACKING, CELL PHONE SIGNALS INTERCEPTION. there is a huge increase in the number of CYBER CRIMES, FRAUD AND CHEATING CASES.
THE SOFTWARE INDUSTRY being one of the world's most progressive industries, has evolved as a result of computers	PEOPLE ARE BECOMING LAZIER AND DEPENDENT ON TECHNOLOGY, children also prefer to play in device games instead outdoor games.

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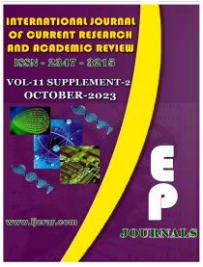

8. Emerging Technologies

Cutting-edge advancements in the ICT field, such as artificial intelligence, blockchain, quantum computing, and IoT (Internet of Things).

Science and Technology Affecting Human Life?

Science is a base of methodical knowledge, which includes a chain of steps to get the possible outcome. science is generally related to theories and it also give focus on analysis and brings advantages to mankind, while technology concerned with the applied science includes processes in the study of particular science is undertaken with the help of tools and knowledge.

Indigenization of Technology

Indigenization in an action or process to bring anything under the control, dominance or influence of the people those are native to an area. It is a substitution of imported products which are manufactured within country.

"MAKE IN INDIA" scheme was launched in 2014 to improve India's manufacturing. this schemes was to support the indigenization of technologies in various sector like defence ICT, electronics, space, transport etc.

Table.2

Advantages of indigenization of technology	Limitations of indigenization of technologies
It was a huge impact on psychological and socioeconomical development. It will open a new vista for various jobs in manufacturing and other sectors.	Indigenous technology may be cheaper but inferior to other technologies available in global market
It will make the product very cost effective and much cheaper for the same quality which is imported	It may lead to higher wastage and increase production costs which will reduce demand for a product.
It improve scope of research and development sector India.	This technology TESTED IN ONLY ONE COUNTRY, there are chances that it may not work if environment or other factors change

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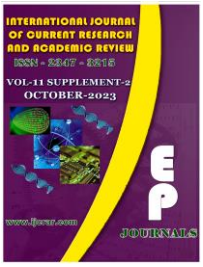

Table.3 Mathematics involved in science and technology in ancient and medieval India

Development of science and technology in ancient india	Development of science and technology in medieval india
A good knowledge of measurements an geometry is the town planning of HARAPA.THE SULVA SUTRAS is supposed to be origination of Indian mathematics. BAUDHAYAN was the first person to calculate the value of PIE;PYTHAGORAS THEOREM is found in baudhayan'ssulva sutra.	People from ARABIA,PERSIA AND DARAS ALSO FROM CENTRAL ASIA were invited to teach in madras. Arithmetic, mensuration, geometry, were included in primary eduucation
The summary of mathematics was mentioned in Aryabhatta's book, known as ARYAVHATIYA. He explained zero as symbol as well as a concept, which helped him in understanding the accurate distance between the earth and the moon he also mentioned that 'EARTH IS ROUND AND ROTATES ON ITS OWN AXIS". He also correctly stated that reflected sunlight is the reason behind the luster of the moon and the planets.	AKBAR MADE MATHEMATICS AS A STUDY SUBJECT DURING HIS REGIME

Table.4 Application of graph theory and how it plays a role in it

GRAPH THEORY IS APPLIED IN SCIENCE AND TECHNOLOGY BY:	**Graph theory plays a crucial role in science and technology**:
1. **Social Networks**: Graph theory is widely used to study social networks like Facebook, Twitter, and LinkedIn. It helps in understanding the structure of these networks, identifying key influencers, and predicting the spread of information or diseases within them.	1.**Network Analysis**: Graph theory is used extensively to analyze and understand complex networks. In science, it is applied to study biological networks (protein-protein interaction networks, metabolic networks, and gene regulatory networks), social networks, transportation networks, and more. In

EXCELLENT PUBLISHERS

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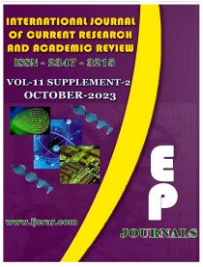

2. **Internet and Web**: The internet itself is a massive graph of interconnected devices and websites. Graph algorithms are crucial for optimizing routing, search engines, and recommendation systems on the web.
3. **Transportation and Logistics**: Graphs are used to model transportation networks such as road networks, airline routes, and public transportation systems. Algorithms for finding the shortest path or optimizing transportation routes rely heavily on graph theory.
4. **Biology and Genetics**: In biology, graphs can represent protein-protein interaction networks, metabolic pathways, and phylogenetic trees. Graph algorithms are used to analyze DNA sequences and identify genetic patterns.
5. **Chemistry**: Molecular graphs are used to represent chemical compounds, with atoms as nodes and chemical bonds as edges. Graph algorithms are employed in chemical informatics to study molecular structures and properties.
6. **Image Processing**: Graphs are used in image segmentation, where pixels are connected based on similarity, to identify objects and patterns in images. Graph-based algorithms also aid in image compression and feature extraction.
7. **Machine Learning**: Graphs are used in various machine learning applications, such as graph neural networks (GNNs) for tasks like node classification, link prediction, and

technology, it is used to analyze computer networks, communication networks, and internet infrastructure.

2.**Social Media**: In the realm of technology and social sciences, graph theory is essential for studying social networks on platforms like Facebook and Twitter. It helps identify influencers, study the spread of information, and detect communities within these networks.

3.**Web Search and Ranking**: Search engines like Google use graph-based algorithms (PageRank) to rank web pages. The internet can be viewed as a graph of interconnected web pages, and graph theory is instrumental in developing algorithms for web crawling and page ranking.

4.**Routing and Optimization**: In technology, graph algorithms are used for optimizing routing in computer networks and logistics, which includes package delivery, airline routes, and public transportation systems. For instance, the shortest path algorithms are critical for GPS navigation systems.

5.**Machine Learning**: Graph neural networks (GNNs) are a type of machine learning model that has gained popularity in recent years. GNNs are used for various tasks, including recommendation systems, fraud detection, and natural language processing. They operate on graph-structured data, making them useful for modeling relationships in complex systems.

6.**Biology and Genetics**: Graph theory is used in biology and genetics to model relationships among genes, proteins, and other biological entities. This helps in understanding complex

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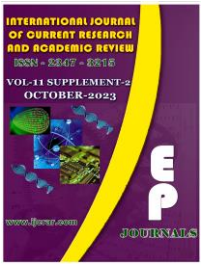

recommendation systems.

8. **Circuit Design**: Electronic circuits can be represented as graphs, with components as nodes and connections as edges. Graph theory helps optimize circuit design and analyze signal flow.
9. **Cybersecurity**: Graphs can represent computer networks, and analyzing the connectivity patterns can help identify network vulnerabilities, detect anomalies, and enhance cybersecurity measures.
10. **Healthcare:** Graph theory is used in epidemiology to model disease spread and analyze contact networks. It's also employed in healthcare systems for patient record management and optimizing healthcare delivery networks.
11. **Energy and Power Systems**: Graphs model power grids and energy distribution networks, helping in efficient power flow analysis, fault detection, and grid optimization.
12. **Finance**: Graphs are used in financial markets to model interdependencies among assets and analyze risk factors. They also aid in fraud detection and credit risk assessment.
13. **Natural Language Processing**: In NLP, graphs are used for various tasks, such as parsing syntactic structures, representing semantic networks, and modeling document relationships.
14. **Recommendation Systems**: Graph-based recommendation algorithms are used by platforms like Netflix and Amazon to suggest

biological processes, such as protein-protein interactions and metabolic pathways.

7.**Image Processing**: Graph-based techniques are employed in image segmentation, where pixels with similar characteristics are connected in a graph to identify objects and regions in images. Graph cuts and spectral clustering are commonly used graph-based methods in image processing.

8.**Circuit Design**: Electrical circuits can be represented as graphs, with components as nodes and connections as edges. Graph algorithms are used in circuit design for optimization, analysis, and simulation.

9.**Cybersecurity**: Graph theory is used to model and analyze computer networks, aiding in the detection of network intrusions, identification of vulnerabilities, and understanding the flow of data within networks.

10.**Energy and Power Systems**: Power grids are modeled as graphs, and graph theory is used to optimize energy distribution, analyze power flow, and manage the reliability of energy systems.

11.**Finance and Economics**: Graph theory is applied to model financial networks, such as stock market interconnections and banking systems. It helps in understanding systemic risks and contagion effects in the financial sector.

12.**Transportation Planning**: Urban planning and traffic management benefit from graph theory when modeling road networks, optimizing traffic flow, and planning public transportation routes.

13.**Healthcare**: In healthcare, graph theory is used to model disease transmission networks, patient

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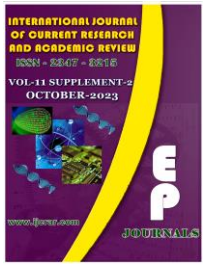

products or content based on user preferences and item relationships. 15. **Optimization**: Graph theory is applied in optimization problems, including job scheduling, resource allocation, and network flow problems.	data relationships, and healthcare provider networks, aiding in epidemiological studies and healthcare resource allocation. 14.**Natural Language Processing**: Graph-based representations, like dependency trees and semantic networks, are used in NLP for parsing, sentiment analysis, and information retrieval.

Development of New Technologies

There are six work under indigenization and development of new technology in India

Agriculture

Major share in our GDP

Automobiles

Part of connectivity in India

Defense

Prime sector for maintaining security of India

Information and Communication Technology

Fastest growing and the most neede sector in India.

Health and Biotechnology

An emerging field and the future of science and technology

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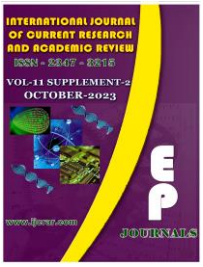

Space

Symbolic significance in the field of science and technology.

Graph theory in various technology

Space Technology

- Satellite Networks: Graph theory is used to model and optimize satellite communication networks, including the placement of satellites and routing of signals.
- Orbit Analysis: Graphs represent orbital structures and trajectories, aiding in space mission planning and navigation.

Energy

- Power Grids: Graph theory helps analyze and optimize electrical grids, ensuring efficient power distribution and fault detection.
- Smart Grids: In the context of smart grids, graphs represent connections between power sources, consumers, and devices, enabling better energy management.

Communication and Information Technology

Network Topology: Graphs model computer networks, enabling efficient data routing and network design.

Social Networks

Graph theory is used to analyze social media networks and improve information dissemination and targeting.

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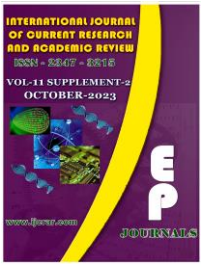

Internet Infrastructure

It plays a role in understanding the structure of the internet and optimizing its performance.

Defense Technology

Network Security

Graphs are used to model and analyze computer and communication networks for vulnerabilities, intrusion detection, and threat assessment.

Tactical Planning

In military operations, graph theory helps with route planning, resource allocation, and logistics.

Superconductivity

Material Structures: Graphs represent crystal lattice structures, aiding in the understanding and discovery of superconducting materials and their properties.

Lasers

- Optical Networks: Graph theory helps optimize optical communication networks, ensuring efficient data transmission using lasers.
- Laser Pulse Propagation: Graphs can represent the propagation of laser pulses in optical systems, aiding in laser design and performance analysis.

Artificial Intelligence (AI)

- Knowledge Graphs: Graphs are used to represent structured knowledge, enabling AI systems to reason and make informed decisions.

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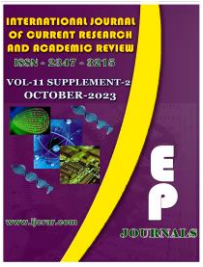
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



- Natural Language Processing (NLP): Dependency graphs and semantic networks are used in NLP for parsing and understanding text.

Robotics

- Robot Navigation: Graphs represent environments, helping robots plan optimal paths, avoid obstacles, and navigate efficiently.
- Sensor Networks: In multi-robot systems, graphs model communication and collaboration among robots.

Nanotechnology

- Molecular Graphs: Graphs represent molecular structures and interactions, facilitating the design and analysis of nanomaterials and devices.

Biotechnology

- Protein-Protein Interaction Networks: Graphs model interactions among biomolecules, aiding in drug discovery and understanding biological processes. Genomic Analysis: Graph theory is used in genomics to study genetic networks, sequence alignment, and phylogenetic trees.

Table.5 Pros and cons of communication and information technology

Pros of Communication and Information Technology:	**Cons of Communication and Information Technology**:
1.**Global Connectivity**: ICT has made it possible to connect with people and access information from all around the world. This has expanded opportunities for global collaboration, trade, and cultural exchange.	1.**Privacy Concerns**: The digital footprint created by online activities raises privacy concerns. Personal data can be collected, shared, and exploited without consent.
2.**Efficiency**: It significantly enhances efficiency in various sectors. Businesses can streamline operations, automate processes, and reach a wider audience, while individuals can access information and services	2.**Cybersecurity** Threats: As technology advances, so do cyber threats. Cyberattacks, data breaches, and identity theft are growing concerns.

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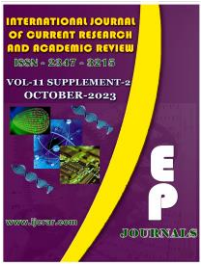

quickly.

3.**Communication**: ICT tools like email, instant messaging, and video conferencing have improved communication, enabling real-time interactions regardless of geographic locations.

4.**Information Access**: The internet provides access to vast amounts of information, which can be educational, informative, and empowering. It has transformed education, research, and journalism.

5.**Cost Savings**: In many cases, ICT solutions can reduce costs through automation and remote work, saving on office space, commuting expenses, and more.

6.**Innovation**: ICT drives innovation by enabling the development of new technologies and applications. This leads to new business models, products, and services.

7.**Healthcare**: Telemedicine and health information systems allow remote diagnosis and consultation, improving healthcare access and reducing geographical barriers.

8.**Environmental Benefits**: Virtual meetings, online shopping, and digital documents can reduce paper usage and carbon footprints, contributing to environmental sustainability.

.

3.**Digital Divide**: Not everyone has equal access to ICT resources. The digital divide can exacerbate existing social and economic inequalities.

4.**Information Overload**: The abundance of information can lead to information overload, making it difficult to filter out relevant and accurate data from noise.

5.**Job Displacement**: Automation and AI can lead to job displacement in certain industries, requiring workers to adapt and acquire new skills.

6.**Health Issues**: Excessive screen time and sedentary behavior can lead to health issues like eye strain, obesity, and mental health problems.

7.**Misinformation and Fake News**: The ease of sharing information online has led to the spread of misinformation and fake news, impacting public discourse and decision-making.

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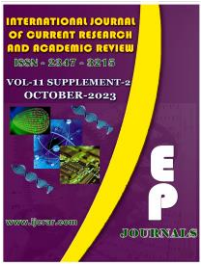

Specific applications of graph theory in ICT

1. Network Topology Analysis

Network Design

Graph theory is used to design and optimize computer and communication networks, determining the layout and connections of devices (nodes) and communication channels (edges).

Network Routing

Graph algorithms are applied to find efficient routes for data packets in computer networks, optimizing data transmission.

2. Social Network Analysis

Online Social Networks

Graph theory is essential for modeling and analyzing social networks like Facebook, Twitter, and LinkedIn. It helps identify influential nodes, detect communities, and study information diffusion within these networks.

Recommendation Systems

Graph-based algorithms are used to make personalized recommendations by analyzing user interactions and relationships.

3. Web and Internet Technologies

Web Structure

The World Wide Web is represented as a directed graph, with web pages as nodes and hyperlinks as edges. Algorithms like PageRank are used to rank web pages.

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Web Crawling

Graph algorithms help web crawlers navigate and index websites efficiently, ensuring comprehensive coverage.

Information Retrieval

Graph-based models assist in understanding document relationships and improving search engine results.

4. Data Mining and Analysis

Graph Databases

Specialized graph databases like Neo4j are used for storing and querying data with complex relationships, making them suitable for applications like social media analytics and fraud detection.

Anomaly Detection

Graph theory aids in identifying unusual patterns in data, whether it's for detecting network intrusions or financial fraud.

5. Telecommunications

Telecommunication Networks

Graphs model the structure and connections in telecommunication networks, aiding in call routing and optimizing signal transmission.

Circuit Switching and Packet Switching

Graph theory concepts are applied to design circuit-switched and packet-switched networks for voice and data transmission.

EXCELLENT PUBLISHERS

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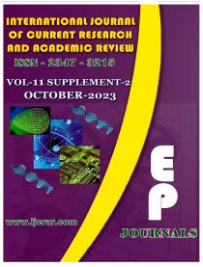

6. Cryptography and Security

Network Security

Graph theory helps model and analyze network topologies for vulnerabilities, enabling better intrusion detection and security protocols.

Public Key Infrastructure

Certificate authorities use graph-based trust networks to establish the authenticity of digital certificates.

7. Wireless Communication

Wireless Sensor Networks

Graph theory assists in designing and optimizing the deployment of wireless sensors for data collection in various applications like environmental monitoring and industrial automation.

Mobile Ad-Hoc Networks (MANETs)

Graph algorithms help MANETs adapt to changing network topologies and establish efficient routes for mobile devices.

8. Data Visualization

Network Visualization

Graph theory is used to create visual representations of complex network structures, aiding in network management and understanding.

9. Content Delivery Networks (CDNs)

CDNs use graph-based algorithms to efficiently distribute web content and multimedia files to users based on their geographic locations, reducing latency and improving load times.

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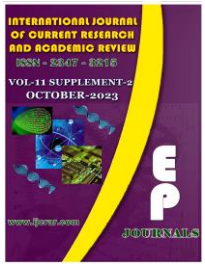

Conclusion

Graph theory is a foundational and indispensable mathematical framework within Information and Communication Technology (ICT). Its applications are pervasive, impacting various aspects of ICT, from network design and data modeling to optimization algorithms and cybersecurity. Graph theory enables us to model, analyze, and solve complex problems related to connectivity, relationships, and data structures, making it a powerful tool for addressing the challenges and opportunities presented by the ever-evolving world of ICT. As ICT continues to advance and expand its reach, graph theory will remain a fundamental component, contributing to the development of innovative solutions and technologies in this dynamic field. Furthermore, as ICT continues to evolve with emerging technologies such as IoT (Internet of Things), 5G networks, and distributed systems, graph theory's importance is set to grow, offering solutions to new challenges and complexities. In essence, graph theory serves as a foundational mathematical backbone, driving innovation, efficiency, and problem-solving in the dynamic world of ICT.

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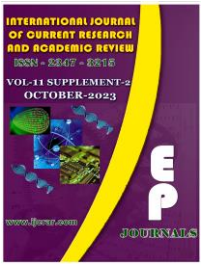

Full Length Article **IJCRAR/FL/17**

Production of Pectinase from Orange Peel by Aspergillus niger Using Submerged Fermentation

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Abstract

An enzymes known as pectinases catalyze the breakdown of pectins. Orange fruit wastes were made more valuable by extracting pectin from the peels and using it to produce pectinase by submerged fermentation with Aspergillus niger. The maximum pectinase production was observed in 1 % orange peelusing Fermentation. High pectinase production was observed at 72 hrs of incubation at 30°C with the initial pH of 4.5. Pectin from orange peels was used as the sole carbon source to encourage the growth of pectinolytic fungus that was isolated from their natural environment. Pectinase activity increased with ammonium nitrate as the nitrogen supply, at the ideal pH, and temperature. The findings of this study may contribute to environmental cleanup efforts where waste is turned into wealth because pectinase can also be utilized commercially for the clarity of orange juice.

Keywords: *Aspergillus niger*, Orange peels, Pectinase, Submerged fermentation.

Introduction

Pectinases play a significant role in the food industry, particularly in the processing of fruits and vegetables. Their main function is to reduce viscosity and aid in the clarification of fruit juices and wines etc. (Kashap *et al.,* 2001). These enzymes offer not only an economically feasible alternative

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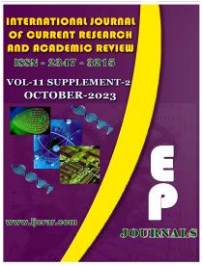

but also have environmentally friendly properties. The microbial pectinase constitutes approximately 25% of the global enzyme sales (EI Enshasy *et al.,* 2018). These pectinases are part of a group of enzymes responsible for breaking down pectin, a complex polysaccharide predominantly found in the middle lamella of plants (Vries and Visser, 2001). Due to the structural diversity of pectin in different plant tissues, pectinases exhibit various mechanisms of action and can be classified into two main categories: depolymerizing enzymes and demethoxylating enzymes. Depolymerizing enzymes, such as polygalacturonase and pectin lyase, break specific linkages in the pectin chain. Demethoxylating enzymes, like pectinesterase, remove methoxy groups from pectin molecules (Mrudula and Anitharaj, 2011).

The main sources for the pectinolytic enzymes are yeast, bacteria, and a large variety of filamentous fungi for which the most relevant ones are *Aspergillus* strains which are generally regarded as safe (GRAS) in food industry (Sumantha *et al.,* 2005). Pectinase production from *Aspergillus niger* was performed in submerged fermentation and solid state fermentation. The agricultural waste has been used for production of pectinase enzymes in fermentations (Soccol and Larroche, 2008). The present study focused on pectinase production by *Aspergillus niger* under submerged fermentation using orange peel.

Materials and Methods

Collection and preparation of orange peel

Orange (*Citrus sinensis*) fruits were sourced locally from an open market in Madurai. The fruit peels were thoroughly rinsed with sterile distilled water after peeling. The collected peels were minced to pieces and were hot air oven dried at 55°C until constant weight was achieved. The dried peel was diminuted in a mechanical grinder and packed in polyethylene bags for enzyme production.

Isolation and identification of Fungi

The soil samples were collected from agricultural and vegetable waste dump in a sterile plastic container. 1 gram of each soil sample was taken and homogenized in 10 ml of sterile distilled

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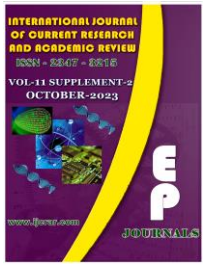

water (10^{-1}) and then serially diluted up to 10^{-8} dilutions. 0.1 ml of aliquot was inoculated on Pectic Agar containing 1% of orange peel powder; 0.14% of $(NH_4)2SO_4$; 0.20% of K_2HPO_4; 0.02% of $MgSO_4.7H_2O$; 0.10% of nutrient solution (5mg/l $FeSO_4.7H_2O$;1.6mg/l $MnSO_4.H_2O$; 1.4mg/ml $ZnSO_4.7H_2O$; 2.0mg/l $CoCl_2$), of pH 5.0. The mixture was incubated at 28°C for 24h and a loop of the homogenized medium was then streaked onto the same medium containing 2% agar and incubated at 30°C for 3days. The fungal organism was identified by relating the macroscopic and microscopic features of the cultures to "Atlas of Mycology" by Barnett and Hunter (1972). Pure cultures were maintained on potato dextrose agar (PDA) slants and sub cultured periodically throughout the research.

Preparation of spore suspension and seed inoculums

Matured fungal spores were transferred into 5 ml sterile water. All the spores were thoroughly scrapped out using spatula. The resulting spore suspension (1 x 10^6 spores/ml) was transferred in to a sterile test tube. Then 1 ml of spore suspension was inoculated in to 100 ml sterilized orange peel extract containing 0.5% glucose and incubated in an orbital shaker maintained at 30°C for 12 h.

Submerged Fermentation

Submerged fermentation (SmF) was carried out using the method described by Yogesh *et al.*, (2009). A 250 ml Erlenmeyer flasks containing 100 ml of sterile cultivation medium made up of 0.1% NH4NO3, 0.1% MgSO4.7H2O, 0.1%NH4H2PO4 and 1% ground orange peel was autoclaved at 121°C for 20min. After sterilization, the seed inoculums were inoculated in to production medium and incubated for 5 days at 28°C. At 24h interval, a culture medium was collected and the mycelia biomass separated by filtration under sterile conditions. The filtrates were analyzed for pectinase activity.

Pectinase Assay

A total 0.5 mL of 0.5% laboratory produced pectin in 0.05 M acetate buffer, pH 5.0 and 0.5 mL of cell-free filtrate was employed. The solution was incubated for 1 h and absorbance was taken at

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575 nm. One unit of pectinase activity is the quantity of pectinase in 1mL that liberated the reducing sugar equivalent to 1 µg glucose per minute under specified conditions (Anisa *et al.,* 2013).

Protein assay

Protein was determined by the method of Lowry *et al.,* (1951) with Bovine Serum Albumin as standard.

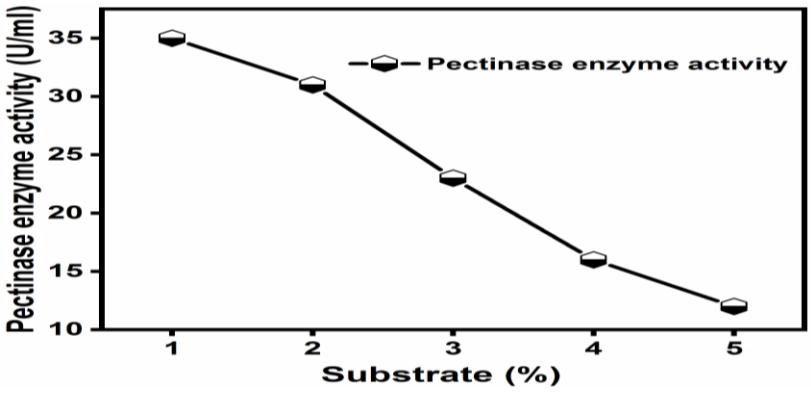
Optimization of enzyme production

The optimum parameters were selected on different concentration of orange peel substrate (1 – 5 %), temperature (20 - 50°C), pH (4 - 6), different carbon sources (fructose, starch, orange peel, xylose) and nitrogen sources (Yeast extract, casein, Ammonium nitrate, Potassium nitrate). (Mrudula and Anitharaj, 2011; Ajayi *et al.,* 2021)

Results and Discussion

Based on the colony morphology and microscopic observation, the fungal isolate used in the present study was confirmed as *Aspergillus niger*.

Fig.1 Different concentration of Orange peel for enzyme production



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Selection of suitable concentration of orange peel substrate was used for a submerged fermentation. Among the five concentrations, 1 % of orange peel was found to be the maximum pectinase production by *Aspergillus niger* (Figure – 1). Similar results were also reported by Phuela *et al.,* (2005).

Effect of pH and Temperature

Production of maximum pectinase activity was strongly influenced by pH and temperature of the fermentation medium. Pectinase production by *A. niger* was observed in the range of pH 4.0 – 6.0 and a maximum enzyme activity was observed at pH 4.5 (33U/ml) at 72 hours (Figure 4). Although Ogbonnaya and Chukwuemeka (2016) reported optimum pH 4.0 for pectinase produced by *Aspergillus niger* BC23 isolated from *Irvingia gabonensis* (African mango) fruit.

Another important factor that significantly affects the growth and production of pectinase enzyme is the temperature of the medium. Maximum pectinase production (28U/ml) was obtained at 30^{o}C (Figure 3). So the optimum temperature for the production of protease was found as 30^{o}C. Ajayi and Atolagbe (2015) have documented 35^{o}C as the optimal temperature for pectinase produced by *Aspergillus niger* which differs from the results in this study.

Fig.2 Effect of Temperature

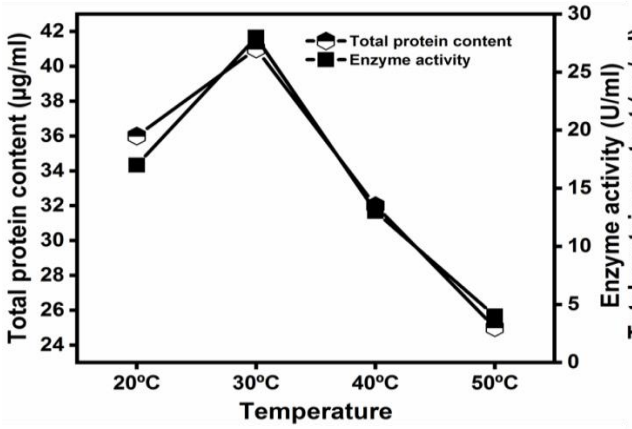
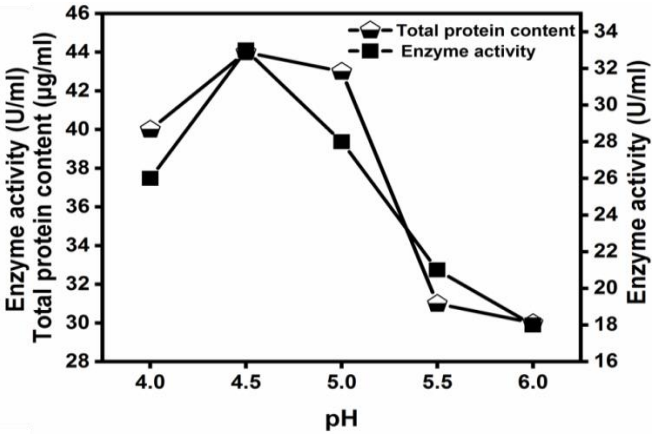


Fig.3 Effect of pH



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Effect of different Carbon and Nitrogen sources

The carbon sources in the form of either monosaccharides or polysaccharides may influence the production of enzymes. The isolated fungal isolate shows high enzyme production (31U/ml) in fermentation medium with orange peel as sole source of carbon. The other substrates gave comparatively less production of pectinase enzyme. There are several reports supporting that the *A. niger* produces high quantity of pectinase using orange peel (Figure 4). Similarly, Ezugwu *et al.,* (2014) reported that *Aspergillus niger* produced the highest pectinase activity using orange peel as substrate. He suggests that orange peels can be used as a source of pectin. Pectin can be used to induce the production of pectinase by *Aspergillus* strains.

Fig.4 Effect of carbon sources

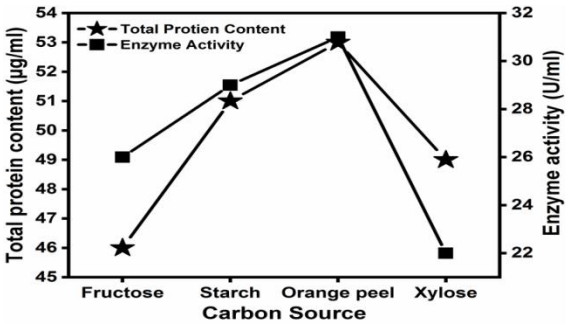
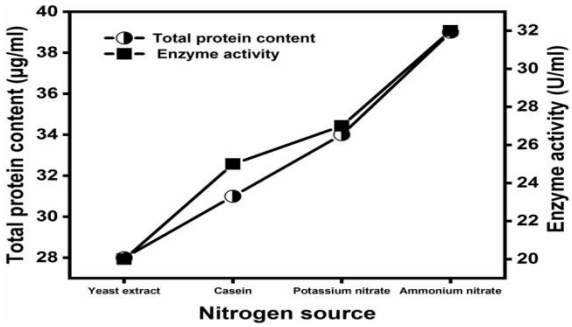


Fig.5 Effect of nitrogen sources



The different of nitrogen sources like yeast extract, casein, starch, potassium nitrate and ammonium nitrate were examined for the production of pectinase in submerged fermentation. The maximum pectinase production (32U/ml) was found in 1% of ammonium nitrate at 72 hours when compared to other nitrogen sources (Figure 5). MohdTaufiq Mat Jalil *et al.,* (2023) revealed that ammonium nitrate was the best nitrogen source in enhancing pectinase production with the highest enzyme activity being 4.64 ± 0.07 U/mL and 3.72 ± 0.08 g/L of *A. niger* growth. In the present study concluded that, a isolated *Aspergillus niger* was screened for the production of pectinase enzyme and reached a maximum level in the medium containing orange peel (1%), ammonium nitrate (1%).The enzyme was observed at maximum rate after 72 hours of incubation at 30^{o}C, pH 4.5.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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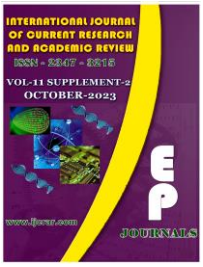

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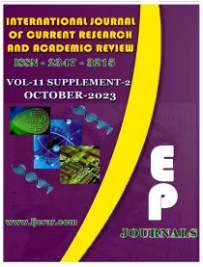

Full Length Article **IJCRAR/FL/18**

Prevalence of ESBL and Carbapenem Resistance of the Gram-Negative Bacteria Isolated from the Tertiary Care Center in Chennai, Tamilnadu, India

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Abstract

Background: Gram negative bacteria have a significant impact on health issues as a result of the evolution of antibiotic resistance. Among the gram negative bacteria Enterobacteriaceae and the non-fermenters are the major group causing infections in all systems of the body mainly by colonizing in the region of intestine, skin and airways. The main issue in the development of antimicrobial resistance, is the determination of the prevalence of resistance which is crucial for drug prescription and understanding the pattern of resistance. Methods: Throughout the course of the investigation, 826 samples of gram-negative bacteria were collected from various patients. Processing of samples, organism identification (HiMedia, Micro Express) were carried out as per the Clinical and Laboratory Standards Institute guidelines (CLSI). Results: The two most common isolates among the 826 samples were K. pneumonia and E. coli. With the exception of Pseudomonas and Acinetobacter, other gram negative bacteria demonstrated 70–80% resistance to ampicillin, amoxicillin-clavulanic acid, and 60–80%, cefuroxime and ceftriaxone. The majority of the antibiotics employed in this investigation did not exhibit any resistance in Pseudomonas spp. None of the S. typhii isolates in the sample exhibited an ESBL resistance pattern. Urine culture of Pseudomonas spp. and Providencia spp. did not exhibit any ESBL resistance patterns. Increased ESBL and Carbapenam resistance organism was observed in the study. Conclusion: The significant element is the antimicrobial resistance pattern of Klebsiella and E. coli to the majority of antibiotics. Prevalence of resistance gene in the collected isolates will be screened in the future study.

Keywords: Gram negative bacteria, Antimicrobial resistance, ESBL resistance, Enterobactericeae.

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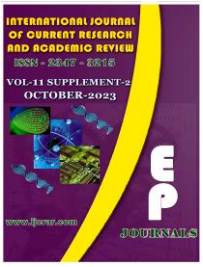

Introduction

Following the discovery of antibiotics, infectious diseases caused by numerous bacteria were rapidly brought under control [1]. One of the most important developments in therapeutic medicine was the discovery of penicillin in the 1940s, ushering in the age of antibiotics reducing the risk in chronic and Intensive Care Unit (ICU) related infections [2]. Over the past few decades, frequent consumption of antibiotic has resulted in the development of antimicrobial resistant (AMR) in the presence of drugs that previously negatively affected them. AMR microbes can withstand different antibiotic exposures by four main ways - i) intrinsic resistance is how microorganisms alter their structure or cellular components to become resistant; ii) acquired resistance, in which the organism acquires new resistant genes in order to develop resistance; iii) mutation in DNA, which alters the protein structure thereby preventing antigen recognition; iv) horizontal gene transfer via diverse reproductive processes like transformation, conjugation, and transduction[3]. Gram negative bacteria that have gained antibiotic resistance can have major deleterious consequences on immunosuppressed people. Furthermore, the development of antibiotic resistance to gram negative bacteria induced nosocomial infection is a major burden for medical personnel [4]. The structure of gram negative bacteria especially the presence of outer coat increases the resistance pattern to broad spectrum of antibiotics. The secretion of beta-lactamase hydrolyses the beta lactams present in the periplasmic space and inhibits the penicillin binding region [5].

Presently, two group of gram negative bacteria namely *Enterobacteriaceae* and the non-fermenters develop resistant to the available antibiotics. These bacteria are responsible for the 45-70% of the ventilator associated pneumonia and 20-30% of the catheter related infections[5]. These gram negative bacteria have the capability to invade all the regions of the body including digestive, nervous, urinary, and the circulatory system. Moreover, in immuno-compromised patients, it can colonize and rapidly spread to various body systems[4]. The resistant pattern of the organisms varies based on geographical, inappropriate use of antibiotics and self-medication [6]. Currently AMR is the important crisis in the medical field and according to WHO, AMR is one of the top 10 global public threat. In India, the rate of resistance to antibiotics is increasing with subsequent failure in treatment and increases the mortality rate [7]. Dispersal of ESBL resistant and Carbapenem resistance increase is the alarming threat but the distribution of resistance strain in

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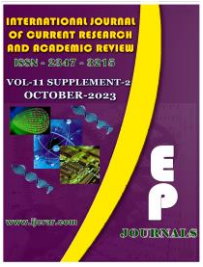

various parts of the country is not known mainly due to less data availability [8]. Due to the absence of a centralized monitoring organization, there aren't many studies being conducted in India to screen for AMR patterns of the organism [7]. In the present study, the antibiotic resistant pattern of gram negative bacteria against various antibiotics was studied.

Materials and Methods

This retrospective study was carried out for a year (May 2020 to April 2021) where 826 samples collected at the tertiary care center located in Sree Balaji Medical College and Hospital, Chengalpat district of Tamil Nadu, India. The sample was carefully chosen to prevent repetition. Information regarding the type of culture, organism sensitivity, sample sources (urine, blood, wound swab/pus, stool, sputum and tracheal aspirations) were procured form both out-patients (OP) and in-patients (IP) records maintained in the Department of Microbiology. Processing of samples, organism identification to the genus/ species level and antimicrobial sensitivity (HiMedia, Micro Express) were carried out as per the Clinical and Laboratory Standards Institute (CLSI) guidelines.

Antimicrobial susceptibility testing

Antimicrobial susceptibility test was carried out on the Mueller Hinton agar medium using the disc diffusion method as explained by the CLSI guidelines. Various antibiotic discs including ampicillin, amoxy-clav, aztreonam, cotrimoxazole, ciprofloxacin, cefotaxime, cefixime, ceftazidime, ceftriaxone, cefoxitin, gentamycin, amikacin, imipenem, piperacillin-tazobactum (HiMedia Laboratories) were used in study. The results were interpreted as per the zone size interpretative guidelines of CLSI in terms of 'sensitive', 'resistant', and 'intermediate sensitive'. *E.coli* ATCC 25922 and *Klebsiella pneumoniae* ATCC 13883 were tested in every set of experiments, in parallel, as part of quality control.

Phenotypic identification of ESBL resistant strains

For ESBL screening, bacterial isolates were examined for their susceptibility to third-generation cephalosporins by using ceftriaxone, ceftazidime (30 µg), and cefotaxime (30 µg) disks as per CLSI guidelines.

EXCELLENT PUBLISHERS

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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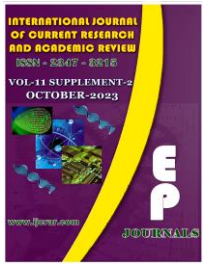

Phenotypic identification of Carbapenamase producer

Caarbapenamase producing microorganism was phenotypically confirmed using Modified Hodge Test. The organisms were grown in the respective media and inoculate the organism in Mueller–Hinton agar plates. Leave the plate for 10 minutes for air drying and place the Meropenem antibiotic disc (10 mcg). Incubate the plate for 24 hours at 37 deg Celsius. Based on the CLSI guidelines the results were interpreted. *E. coli* ATCC 25922 was used as an indicator organism.

Results and Discussion

Number of different organism collected in the study period

A total of 826 samples were collected of which 254 isolates (30.75%) were *E.coli,* 252 were *Klebsiella spp* (30.5%) and *Pseudomonas* (16.34%). There were 417 (50.48%) urine samples, 271 (32.8%) exudate samples, 71 (0.08%) sputum cultures, 57 (0.06%) blood cultures, 7 (0.008%) vaginal smear cultures, 2 (0.002%) tissue cultures, and 1 (0.0012%) ear samples among the remaining samples (Fig. 1).

Different sample source

The total number of *E. coli* isolates were 254, of which 227 were obtained from urine cultures, 22 from blood samples, 3 from sputum samples, and 4 from vaginal samples. There are 252 total *Klebsiella* samples, of which 100 are exudate samples, 11 are blood samples, 97 are urine samples, 41 are sputum samples, and 3 are vaginal smear samples. Out of the 12 samples of *Enterobacter* that were isolated, 7 samples were taken from exudate and 5 samples were taken from urine culture. 12 *Citrobacter* isolates were found, including 4 from exudate, 2 from tissue, and 6 from urine samples. Blood was used to isolate *Salmonella typhi* from 5 samples. *Proteus* has been isolated from 61 samples, including 42 from exudates, 18 from urine cultures, and 1 from blood cultures. Six samples of *Providencia* were isolated, three from urine culture and three from exudates. *Pseudomonas* spp. is the third common bacteria that has been isolated in the past 12 months. A total of 149 samples were gathered, including 42 urine samples, 13 blood samples, 1

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International Journal of Current Research and Academic Review

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Journal home page: http://www.ijcrar.com

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ear sample, 77 exudate samples, and 17 sputum samples. *Acinetobacter* was isolated from 75 samples, including 7 from blood, 38 from exudates, 10 from sputum, and 20 from urine (Fig 2).

Fig.1 Different samples collected from various sources during the period of one year

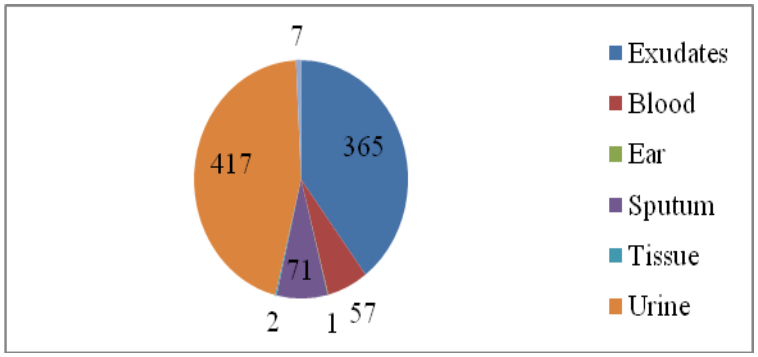
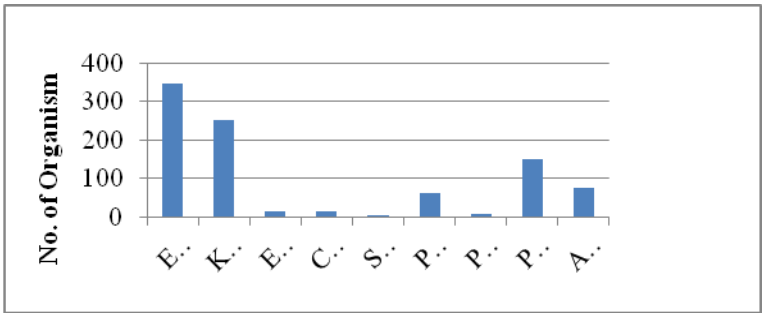


Fig.2 Total number of different organisms isolated during the period of one year



Resistance pattern of the isolated cultures

In this investigation, a total of 23 antibiotics were employed. Using a combined disc test and MIC test strip, an ESBL resistance pattern was also discovered. With the exception of *Pseudomonas* and *Acinetobacter*, other gram negative bacteria demonstrated resistance to ampicillin, amoxicillin-clavulanic acid, and cefuroxime and ceftriaxone of 70–80%. The majority of the antibiotics employed in this investigation did not exhibit any resistance to *Pseudomonas* spp. Exudate sample

EXCELLENT PUBLISHERS

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Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

of *Pseudomonas spp* revealed 40% and 35% resistance to cefepime and ceftazidime respectively. All of the isolates, excluding *E. coli*, were sensitive to imipenem. With the exception of imipenem and tigecyclin, *Proteus* exhibited resistance to all antibiotics. *Acinetobacter* also demonstrated susceptibility to antibiotics such ampicillin, imipenem, cefuroxime, tetracycline, chlortetracycline, cefazolin, azithromycin, meropenem, chloramphenicol, and tigecycline, among others (Table 1).

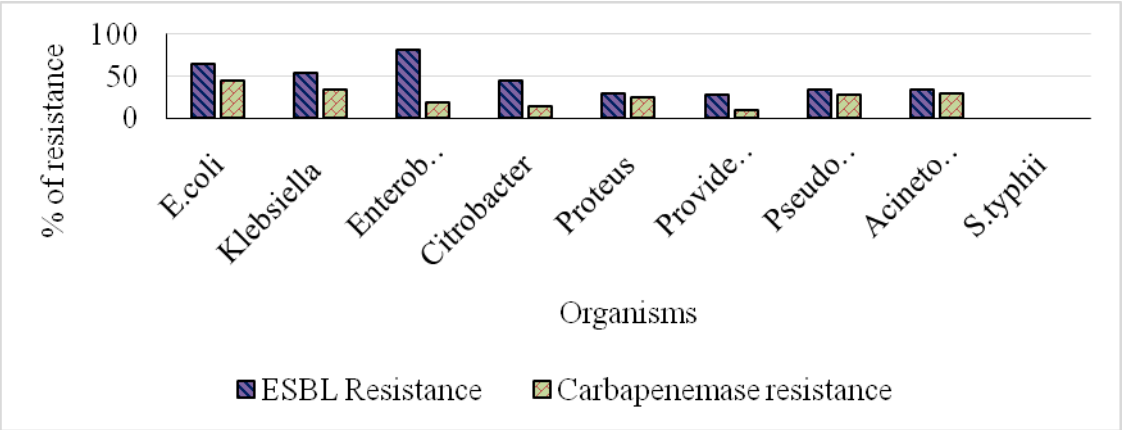
Phenotypic identification of ESBL resistant strains

ESBL resistant strains was phenotypically confirmed by using double disk synergy test method using following antibiotics including Cefotaxime, Cefotaxime/clavulanic acid, Ceftazidime and Ceftazidime/clavulanic acid. Most of the isolates from exudates showing ESBL resistance pattern followed by blood culture. None of the isolates of *S. typhii* showed ESBL resistant pattern in the sample. Urine culture of *Pseudomonas* spp and *Providencia* spp did not show any ESBL resistant pattern (Fig 3).

Phenotypic detection of Carbapenemase Producers

Among the different organisms, Provedencia showed least carbapenamse resistant and E.coli showed more resistant when compared to other organism (Fig 3).

Fig.3 % of ESBL resistance and carbepenamase resistance in the collected isolates



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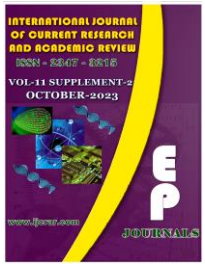

Table.1 % of Resistance showed by different organism using various class of antibiotics.

Organism name	No. of samples	% of Resistance against various Antibiotics																		
		AMC	IMP	TZP	CXM	AMP	CRO	FAM	AMK	TOB	SXT	TCY	CT	CZO	CAZ	CTX	ATM	MEM	GEN	CIP	TGC
E.coli	351	42	18	18	80	90	76	77	38	20	50	55	20	80	60	75	38	10	30	70	45
Klebsiella	252	85		25	70	99	60	60	40	20	45	50	35	75	65	66	50	10	30	40	15
Enterobacter	12	82		30	82	100	100		100	40	40		15	82	80	75		15	40	60	
Citrobacter	12	75	30	45	75	75	65	100			75		45	100	45	75		45	45	75	
Salmonalla typhi	5					20					20									25	
Proteus	61	100				100															
Providencia	6	100		65	100	100	100				30		65	100	100	100				65	
Pseudomonas	149			15				15	15						8		13		13	15	50
Acinetobacter	75			18			65				70				70	70			10	10	

AMC: Amoxicillin/clavulanic acid; IMP: Imipenem; TZP: Piperacillin + tazobactam; CXM: Cefuroxime; AMP: Ampicillin; CRO: Ceftriaxone; FAM: Ampicillin + sulbactam; AMK: Amikacin; TOB: Tobramycin; SXT: sulfamethoxazole; TCY: Tetracycline; CT:Cefotiam; CZO: Cefazolin; CAZ: Ceftazidime; CTX: Cefotaxime; ATM: Aztreonam; MEM: Meropenem; GEN: Gentamycin; CIP: Ciprofloxacin; TGC: Tigecycline.

Discussion

Antibiotic resistance in bacteria is a concern that exists around the world, but India is particularly at risk because of its high antibiotic consumption. In 2010 India recorded a highest usage of antibiotics (1.29 billion units) than any other countries [9]. According to World Health Organisation, the most common antibiotics used in India were carbapenems, lincosamides, glycopeptides, linezolid, and daptomycin which contribute to the increasing problem [10]. The

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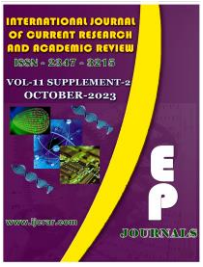

increased consumption rate of antibiotics and its injudicious usage in the animal health has led to the development of AMR in India [11].

The emergence of antibiotic resistance patterns in gram negative bacteria against several classes of antibiotics was demonstrated in this observational study. In the current study, a total of 826 gram-negative bacterial isolates were obtained from the patients and tested for anti-bacterial susceptibility utilizing the disc diffusion method. The predominant organism in this study were *E.coli* and *Klebsiella spp* and most of the organisms were resistant to all the antibiotics including ceftriaxone and meropenem. A previous study conducted in North India also showed the rapid resistance of *E.coli* and *Klebsiella* in the clinical isolates within the decade. The study also showed the rate of resistance in the bacteria is increasing due to the carbapenemases production rather than ESBL[12]. According to a study in the Asian Pacific areas, India and China have a high incidence of ESBL resistant strains[13]. Studies from West Bengal revealed an increase in the occurrence of *E. coli* and *Klebsiella* in urine culture developing resistance to antibiotics like beta lactams, tetracyclines, and third generation cephalosporins [14,15].

Only few investigations regarding the prevalence of AMR organisms have been conducted in South India. In a study conducted from the neonatal intensive care unit at JIPMER in Pondicherry, revealed a high frequency of *K pneumonia* infection and all the isolates were ESBL producers. The study also demonstrated a strong correlation between neonatal mortality and *K. pneumoniae* carrying the CTX-M-15 gene[16]. The next prevalent organism after *E. coli* and *Klebsiella* is *Pseudomonas* spp., a non-fermenter gram negative bacillus. The majority of antibiotics, including imipenem, cefuroxime, ceftriaxone, and sulfamethoxazole, were effective against the bacterium. *Pseudomonas* spp. from urinary tract infections were responsive to imipenem, cefoperazone, amikacin, and ticarcillin, according to earlier investigations from Karnataka [17].
There are many causes for the increase of AMR pattern incidence in India. The primary factor is the prescribing of antibiotics for ailments like fever and the common cold when they are not necessary [18]. Instead of following a doctor's prescription, the pharmacist administer the substitute antibiotics. Additionally, first generation and second generation antibiotics, which are typically unnecessary and contribute to the emergence of AMR in the microorganism, were produced by Indian pharmaceutical businesses in combinational capsules. Finally, non-prescription use of antibiotics by the general public along with improper dosage and timing of

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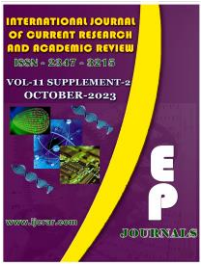

administration leads to the development of antibiotic resistance[15]. Among the antimicrobial resistance, increase in the prevelance of ESBL resistant and carbapenem resistance are classified as an urgent threat. In India, in a single center study showed the increased prevalence of carbapenem resistance organism and the prevelance was high in *A. baumanii and P. aeruginosa* species. In the present study, carbapenem resistance also showed increased prevalence of ESBL resistance and Carbapenem resistance [19].

The present study gave the insights into the prevalence of AMR pattern of gram negative *Enterobactericeae* and non-fermenter gram negative bacilli isolated from our tertiary care center. The main shortcoming of this study is the lack of molecular research that can assist in identifying the genes responsible for the development of a resistant pattern.

Conclusion

The concerning element is the AMR pattern of *Klebsiella* and *E. coli* to the majority of antibiotics. To track the trend in the prevalence of resistant organisms, extensive surveillance studies should be conducted in big multicentric hospitals.

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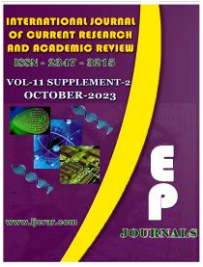

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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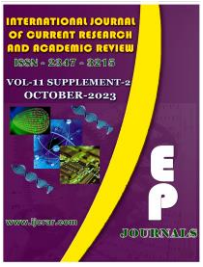

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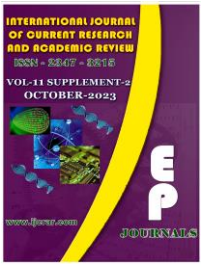

Full Length Article **IJCRAR/FL/19**

Dizziness Detector

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Abstract

In the vehicle security system we recognize the driver's face and give alerts whenever the driver is drowsy and he blinks his eyes and an alarm is ringed to maintain their safety. Drowsiness is one the main reasons/ major causes these days for road accidents. Here, to avoid such kind of accidents we're developing a system which is a drowsiness alert system and vehicle's safety system. By using Artificial Intelligence (AI) technology, we're building this system. Firstly, the image of the driver is captured and it is identified by using face recognition techniques and once the driver is in the vehicle and he starts driving the vehicle, for instance if he feels drowsy there will be an alert/ alarm so that he can get himself awake, take a break and then drive the vehicle. Computer vision and machine learning algorithms are used to design this system. In this system, we're using eye landmarks which determine the EAR (Eye Aspect Ratio ratio) to check whether the driver is drowsy. Face recognition is determined by object detection techniques using Haar Cascade algorithm & LBPH in OpenCV and we're making this system user friendly by adding Graphical user Interface (GUI) using Tkinter. This model can predict with the accuracy rate of 90% and further can be improvised using huge datasets.

Keywords: sleep, Machine learning, Computer vision, human inactiveness, crossing the signals.

Introduction

Every human being needs sleep, lack of sleep causes human inactiveness, improper reflex, losing of focus, gets deviated which decreases the capability to make proper decisions which is necessary for driving a vehicle. As per WHO records about 1.25 million of people were injured or

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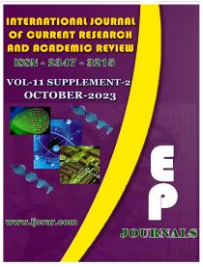

dead due to accidents in a year. Some of them neglect the traffic rules, like over speeding, crossing the signals, crossing the lane, also having technical issues with the break's failure, tires. To mitigate these issues this paper focuses on the solution to reduce the fatal cases by providing a smart drowsiness detection system. This model has an accuracy of 90%. Machine learning, Computer vision are being used in this model which are the subset of AI and it allows the user to train the system and predict the output in a certain range. This technology helps to reduce the gap between human and machines.

Literature Survey

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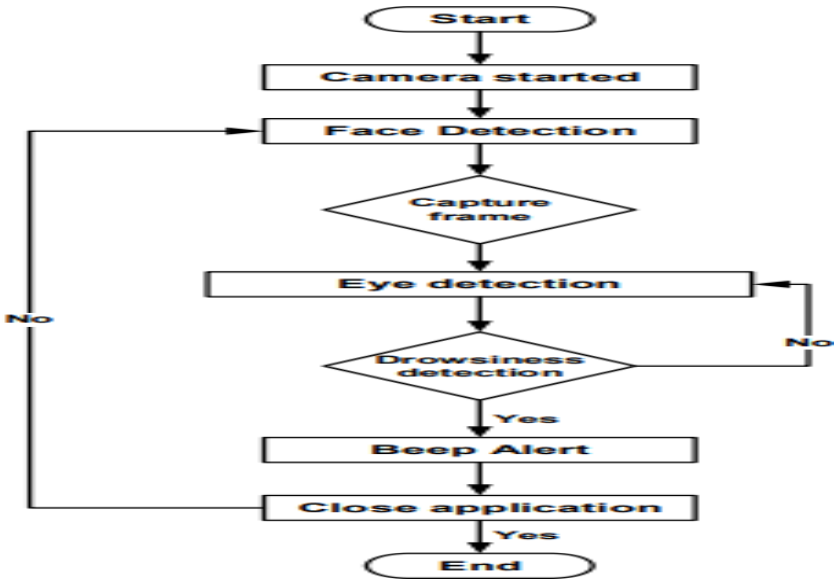
System Design

UML Diagram

UML, which stands for Unified Modeling Language, is a way to visually represent the architecture, design, and implementation of complex software systems.

Fig.1



Activity Diagram

Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. The control flow is drawn from one operation to another.

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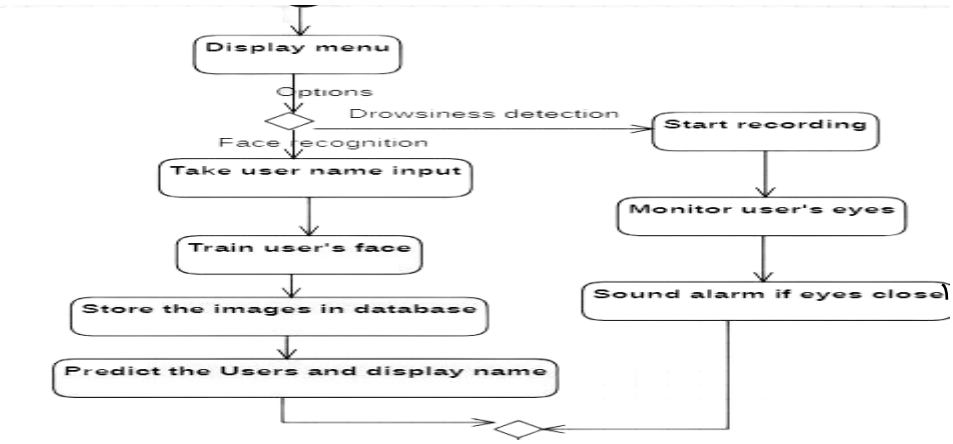
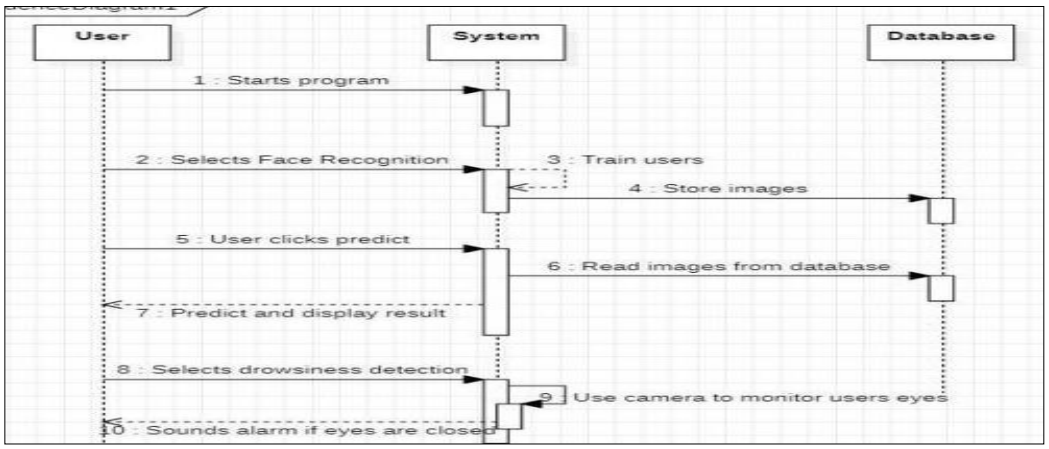
Fig.2



Sequence Diagram

A sequence diagram or system sequence diagram shows process interactions arranged in time sequence in the field of software engineering. It depicts the processes involved and the sequence of messages exchanged between the processes needed to carry out the functionality.

Fig.3



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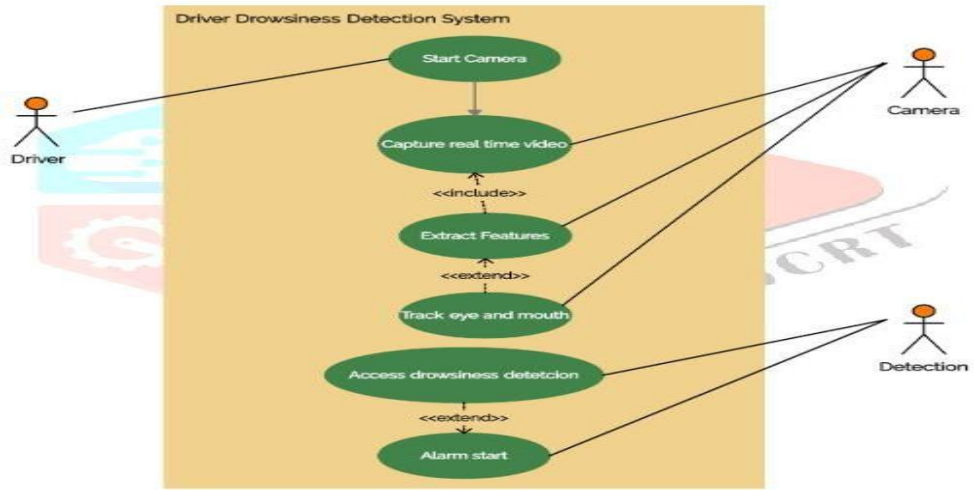
Usecase Diagram

Use case diagram is a graphical depiction of a user's possible interactions with a system. A use case diagram shows various use cases and different types of users the system has and will often be accompanied by other types of diagrams as well. The use cases are represented by either circles or ellipses.

Fig.4



Implementation

In this Python project, we have used Open CV for gathering the images from webcam and feed them into the deep learning model which will classify whether the person's eyes are 'Open' or 'Closed'. The approach we have used for this Python project is as follows:

Step 1 – Take image as input from a camera. With a webcam, we will take images as input. So to access the webcam, we made an infinite loop that will capture each frame. We use the method provided by Open CV to access the camera and set the capture object will read each frame and we store the image in a frame variable.

Step 2 – Detect the face in the image and create a Region of Interest (ROI). To detect the face in the image, we need to first convert the image into grayscale as the Open CV algorithm for object

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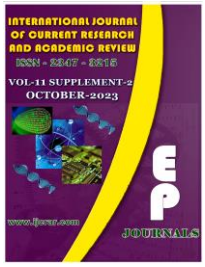
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



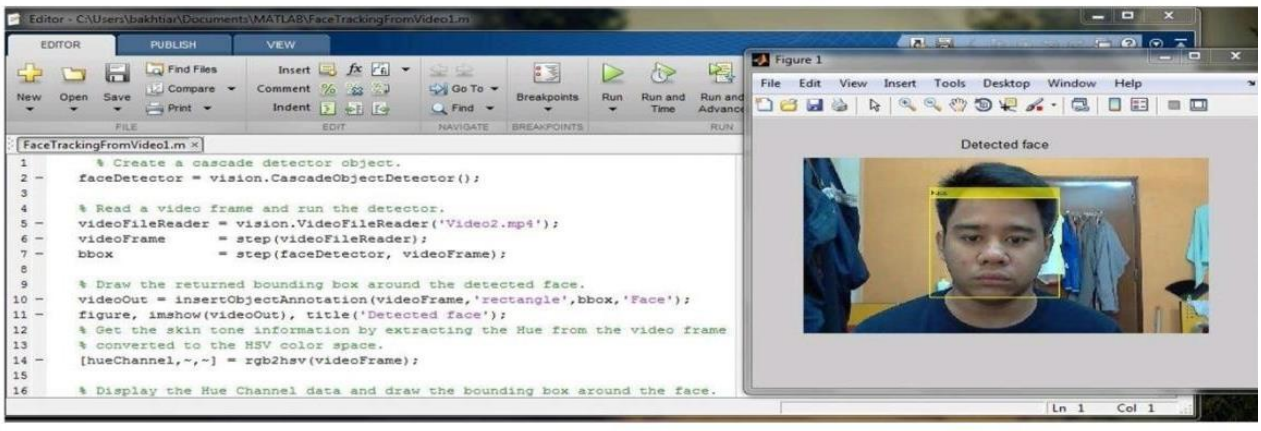
detection takes grey images in the input. We don't need color information to detect the objects. Then we perform the detection. It returns an array of detections with x, y coordinates, and height, the width of the boundary box of the object. Now we can iterate over the faces and draw boundary boxes for each face.

Step 3 – Detect the eyes from ROI and feed it to the classifier. The same procedure to detect faces is used to detect eyes. First, we set the cascade classifier for eyes in leye and reye respectively then detect the eyes. Now we need to extract only the eyes data from the full image. This can be achieved by extracting the boundary box of the eye and then we can pull out the eye image from the frame.

Step 4 – Classifier will categorize whether eyes are open or closed. We are using CNN classifier for predicting the eye status. To feed our image into the model, we need to perform certain operations because the model needs the correct dimensions to start.

Step 5 – Calculate score to check whether the person is drowsy. The score is basically a value we will use to determine how long the person has closed his eyes. So if both eyes are closed, we will keep on increasing score and when eyes are open, we decrease the score. We are drawing the result on the screen using cv2.putText() function which will display real time status of the person.

Fig.5



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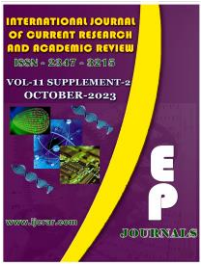

System Security

Introduction

The security system is a driver face monitoring system that can detect driver fatigue and distraction by processing of eye and face regions. After image acquisition, face detection is the first stage of processing. Then, the regions of eye and mouth are detected using the DLIB library and the symptoms of fatigue are extracted from those regions.

In the security system, the main focus and concentration is on the eye status of the individual driving the car. It consists of a parameter called the Eye Aspect Ratio also known as EAR which is an important parameter as it's value plays a key role in the drowsiness detection process.

A threshold value is also assigned at the beginning for the Eye Aspect Ratio. It compares the frequency of the eye to the assigned threshold value. If the value is above, an alarm is generated. Similar to the EAR, when the mouth region is detected, a threshold value is set and if the value is above the threshold frequency, again an alarm Is generated to alert the driver. Lastly, an alert is sent using an email to the concerned person.

Security Software

Data Pre-Processing

The images are tested with the proposed algorithm, preprocessing is accomplished which is the primary stage of any face recognition gadget.... A brand new approach of preprocessing has been proposed for face recognition packages beneath uncontrolled and difficult lighting fixtures situations.

Feature Extraction

As in brief alluded to in advance, primarily based at the facial landmarks that we extracted from the frames of the videos, we ventured into growing appropriate capabilities for our class version. At the same time as we hypothesized and examined several functions, the four core features that

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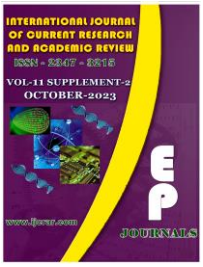

we concluded on for our very last models had been eye element ratio, mouth thing ratio, student circularity, and sooner or later, mouth element ratio over eye thing ratio.

Ear Aspect Ratio (EAR)

EAR, is the ratio of the length and the width of the eyes. The length and width of the eyes is calculated by means of averaging over the two horizontal and vertical lines throughout the eyes as illustrated. Our speculation turned into that once an man or woman is drowsy, their eyes are probable to get smaller and they are probable to blink extra. Based totally On this speculation, we anticipated our model to expect the class as drowsy if the EAR for an character over successive frames declined i.e. Their eyes began to be closeor they were blinking faster.

Training The System

To do face recognition, face recognizer have to learn. The use of the pre-categorized dataset, we have designed a label "dataset" for our face recognition system, which is now used to use that dataset, which first trains the face identifier to use the dataset in OpenCV Python. Python Trainer in the same folder.p "File, and then create a folder in the same directory" Trainer. ", This is the binder where we will save our identifier after coaching. In this system we're adding up two different models, that is drowsiness detection and face recognition for safety and security purposes of the driver. First we will be pooping up with the GUI window which has two buttons, one is drowsiness detection and other is face recognition system.

Conclusion and Future Work

We have measured the driver's safety parameters. Firstly in drowsiness detection model we made an alert system which can alert the driver whenever he feels drowsy for more than 3-4 seconds he'll be alarmed and can stay awake or take a break. Whereas, In the second model, face recognition provides security to our vehicle by detecting the driver's face and providing access. The drowsiness detection system can be implemented in every vehicle such that we can prevent road accidents and decrease the death ratio which are caused due to drowsiness and the face recognition system is very helpful to maintain the security of the vehicle preventing vehicle thefts.

EXCELLENT PUBLISHERS

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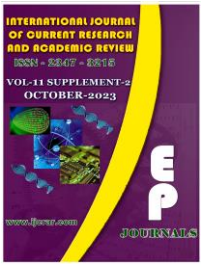

As AI techniques are growing fastly, we can make systems more intelligent to understand the requirements of the hour. We can introduce various models and use different types of algorithms to get the best results. Road accidents are common in countries like India. Due to small negligence there's a huge loss to the lives of the human. By adapting such systems, we can try to control the road accidents and also the security of the vehicle can be maintain by taking the alert and security systems into consideration.

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EXCELLENT PUBLISHERS

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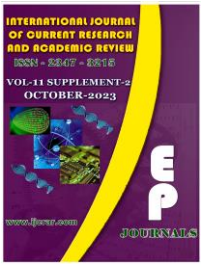

Full Length Article **IJCRAR/FL/20**

Adaptation of Mobile Learning as an E-Resource to Measure the Level of Students and Teachers by Using Statistical Techniques for Higher education Due to Pandemic Era

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Abstract

The Unpredictable growth of Mobile Technologies had spurred in Education. This Mobile technology enhances ICT in education from E-Learning to mobile learning due to Pandemic Era. The main objective of my paper is to adapt mobile Learning as E-Resource to determine the levels of Teachers and Students. To investigate and evaluate the characteristics of Traditional Learning and Mobile Learning of Teachers and Students in various discipline. Their opinions and attitudes are necessary ingredients of mobile learning success in Pandemic Era for Higher Education. The two self designed questionnaires from Teachers and Students by collecting Demographic information, in order to comfort to access the internet for Teaching learning activities by using Desktop Computer, Laptop, Smartphone, Tablets, E-Book Reader and describes their frequency of usage of the Educational activities on mobile devices and to agree or disagree with respect to mobile learning respectively. Here, it is a predictive analysis of opinions and attitudes of Teachers and Students. Therefore, this paper seeks to answer the following questions: In higher education, how do teachers and students make use of mobile devices? and what factors influence teachers' and students' acceptance of mobile learning in higher education? The finding of my paper is to give knowledge regarding teachers' and students' acceptance of mobile learning. Through the collecting of Demographic information from Teachers and Students can be used as Mobile Learning Acceptance Measures like "Teachers' Mobile Learning Acceptance Questionnaire" and "Students' Mobile Learning Acceptance Questionnaire is to be planned to implement Mobile Learning.

Keywords: ICT, Traditional and Mobile Learning, Educational activities, E-learning, Demographic information.

EXCELLENT PUBLISHERS

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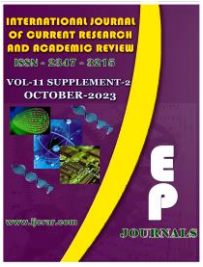
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Introduction

Learn something new is a concept note of Ideal Person. That's new this might be a Mobile Technology to learn. Nowadays, learning is not limited only in classroom. Their boundaries are anywhere at any time. In short term learning, learners are at Excursion, Visits, Field trip to learn something new in outside of the classroom. Likewise, Mobile Technologies include smart phones, Tablets, IPods, E-book Reader, and Portable notebooks.

Everything is used for Educational Purpose. There are so many applications for Educational activities. The connectivity between learners and educators through mobile technologies to interact and to share. Mobile Learning provides Personalized, interactive and adaptable circumstances. The Educational transaction is influenced by New Technologies. Using Technologies to study something is a lifelong Learning. Before Pandemic Era, many Institutions and Organizations have already implemented Mobile Learning for Educators and Learners for Higher Education especially in Pandemic Era.

In traditional Classroom, the learners learn to sit before the blackboard as well as projector delivered lectures. The Traditional Learning, Learning takes place within the classroom over a fixed curriculum with fixed aid. But Mobile learning is across different time, place, topic and technologies.

Traditional Learning is Teacher oriented but Mobile Learning is Technology oriented. Traditional learning emphasizes active engagement in a variety of activities. Mobile learning emphasizes not only device mobility, but also learner mobility and learning experiences. Pegrum (2014) has defined three levels of mobility which are as follows:

1st level

"Only the Devices are Mobile"- the teacher may allow the students to use tablet in the classroom which can be taken to another classroom (mobility of the device). He will ask the student to solve the quiz given in the educational app. But in this case the student is sitting at his desk. The teacher is only providing the information. Although some online networking is possible, the

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

learner and his learning experiences are not mobile. This is just information transmission to the students or behaviorist approach of teaching.

2nd level

"The Devices and the Learners is Mobile"- in the second case the same teacher may ask his/her students to browse more information online related to the topic and share that information with his peers while moving with their tablets in the classroom. Here the learner as well as the device is mobile but not the learning experience because the there is space constraint (inside the classroom). This approach of learning is more constructivists in nature because it fosters interaction and collaboration.

3rd level

"The Devices, the Learners and the Learning Experience are Mobile"- now the teacher may ask the students to move freely to visit the market places, museums and see the buildings, photograph them, annotate the pictures with building's name and information about them and share the pictures online before commenting on their peers' photos.

Here the learning experiences are also mobile because the constraint of space has been removed. Their construction of learning is "situated and embodied". This approach of learning is the most sophisticated and the most suitable of learning as the constraint of time and place has diminished. Mobile learning is characterized by the mobility at all the three levels. (1)

During Pandemic period, Students can download the printed material from Learning Management System such as Google Class Room. Mobile Learning becomes popular and developed due to the success of Mobile Technology. There is a comparison between Technology based activity and paper based activity.

During Pandemic period, Technology based activity is better than Paper based activity. Perceptions and Beliefs are the two main components of Mobile Learning Environment created by Educator and the Learner. Mobile Technology is one of the E-revolution. According to Statista,

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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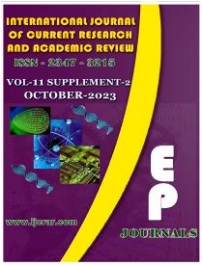

The current global smartphone user population is 6.648 billion, which indicates that 83.89 percent of the global population possesses a Smartphone.

According to Traxler (2009) mobile learning supports five types of novel learning prototypes which are:

Contingent Learning

It is an associative learning which takes place through environment and changes in it by establishing cause-effect relationships. Here, the teaching goals are not pre-defined. It depends upon the responses emitted by the learners.

He assert that while desktop based learning is standardized, fixed, timetabled, productivity-oriented, mobile phones enables "contingency and provisionality". For example, learners during the field trip may gather and process data in real-time and can get feedback regarding their findings.

Situated Learning

This type of learning takes place in authentic or real situations. For example, during museum visits, and excursions students can share pictures and can get information related to the topic of interest, chat with peers and share the information readily. This type of learning is beneficial in teaching History.

Authentic Learning

This type of learning is complementary to situated learning. For example, while the student is in museum he can not only gather information about the artifact (situated learning) but learn about the carbon dating method too for calculating the age of old artifacts.

This is attained through watching videos or taking help from teachers. Thus, mobile learning provides realistic and relevant learning experience which could be useful for vocational and professional courses like nursing, teaching, veterinary sciences and medicine.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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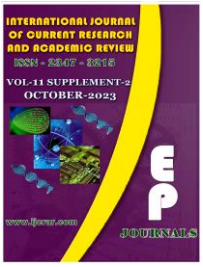

Context-Aware Environment

Context-awareness applies to learning through mobile devices while being engaged in everyday activities of life. Mobile learning provides specific information during specific tasks.

Personalized Learning

Mobile devices offer an excellent platform for personalized learning and also offer wide range of resources according to the level which is suitable for the learner. (2)

The main purpose of the paper is to investigate the use of Mobile Learning for Higher Education by Educators and the Learner through Questionnaire by using Demographic method.

Teachers' Mobile Learning Acceptance Questionnaire

Part A: Demographic Information

Please tick the option that describes you

1. **Name:**_____

2. **Designation:** (a) Assistant Professor (b) Student

3. **Area which closely matches your field of teaching (Educator) or Learning (Learner)**
(a) Tamil (b) English (c) Computer Science (d) Commerce

4. **Age (in complete years)** _____

5. **Gender:** (a) Female (b) Male

6**. How long have you been teaching? (For Teacher) What are you studying? (For Student)**
(a) 0-1 years (b) 2-5 years (c) 6-10 years **(For Teacher)**
(a)Under Graduate (b) Post Graduate **(For Student)**

EXCELLENT PUBLISHERS

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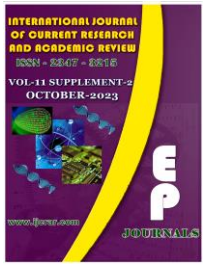
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Part B: Mobile Devices Access and Experience

Please provide information about access to mobile devices and PC and your experience with the devices.

Table.1 Rate the following devices from 1 to 5 in order of convenience and flexibility offered in terms of accessing the internet for teaching-learning activities.

Sl. No	Device	Very convenient		Convenient		Moderately convenient		Inconvenient		Very inconvenient	
		T	S	T	S	T	S	T	S	T	S
1	Desktop Computer	5	11	5	12	15	2	0	0	0	0
2	Laptop	10	7	10	9	5	7	0	0	0	0
3	Smartphone	12	13	12	10	1	2	0	0	0	0
4	Tablets (eg. Apple, iPad)	2	2	12	1	11	14	0	6	0	2
5	E-Book Reader(Like Kindle)	3	0	10	6	12	15	0	3	0	1

Table.2 Select the option which best describes your frequency of usage of the following educational activities on mobile devices (For Teachers and Students)

Teachers

Educational Activities	Never	Rarely	Sometimes	Frequently
Sending and receiving emails	0	0	10	15
Watch Educational You tube Videos	0	5	15	5
Use reference from encyclopedias and dictionaries.	0	0	20	5
Reading e-books/print content	0	2	20	3

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Students

Educational Activities	Never	Rarely	Sometimes	Frequently
Sending and receiving emails	0	0	15	10
Watch Educational You tube Videos	0	10	5	5
Use reference from encyclopedias and dictionaries.	0	10	10	5
Reading e-books/print content	0	15	5	5

Part C: Mobile Learning Acceptance

1. Please a tick mark the options given below that best represents your feeling toward mobile learning.(For Teachers)

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree
Facilitates easy interaction with students' parents	20	5	0	0
Teaching with the help of Mobile learning is an interesting experience	15	10	0	0
I plan to make an online teaching group with my students.	5	20	0	0
Percentage	80%	20%	0%	0%

2.How far do you agree or disagree with the following statements with respect to mobile learning? (For Students)

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree
Immediate information retrieval in mobile learning enhances my engagement.	16	9	0	0
It fosters critical thinking and creativity	8	9	0	0
It helps me in keeping myself updated about the recent developments in the subject.	17	8	0	0
Percentage	64%	36%	0%	0%

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Sampling Framework of Study

Part A (Field of Teaching & Experience in Teaching)

The Preliminary analysis and development of Teacher's research through demographics Datum is collected from 25 students and 25 Teachers. There are two sampling units in this research which are the higher education teachers teaching in Wi-Fi enabled colleges and students studying in Wi-Fi enabled institution. From Part A gives the details of demographic information of 25 Teachers and 25 Students.

The first, second, fourth, Fifth and sixth questions depend upon teachers and Students to answer. The sample Units of field of education for Teachers belong to Tamil, English, Computer Science and Commerce are described in figure 1.1.Figure 1.2 represents Eight staff members have got 0-1 year of Teaching experience, another eight staff members have got 2-5 years of Teaching Experience and nine staff members have got 6-10 years of Teacher's Experience.25 Students are studying Undergraduate.

Fig.1 Field of education (For Teachers)

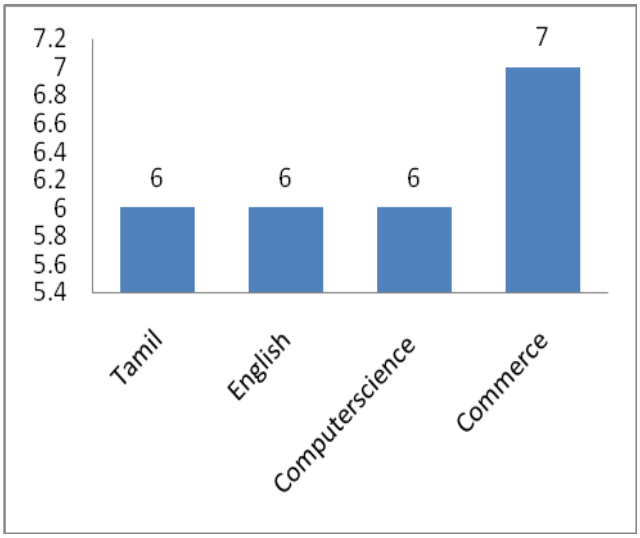


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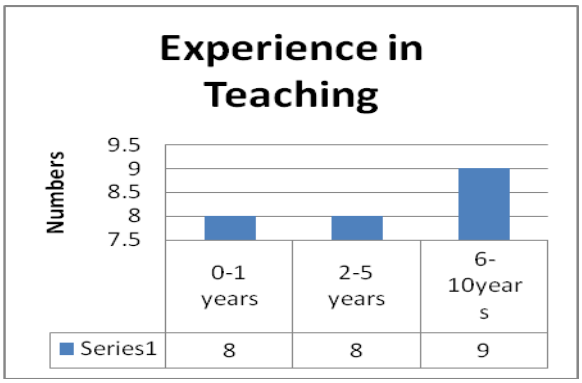
Fig.2 Teacher's Experience



In Part B depicts the Mobile devices access and experience towards 25 Teachers and 25 Students to access the internet for teaching-learning activities. In Desktop Computer, 5 Teachers are very convenient,5 Teachers are convenient, and 15 Teachers are moderately convenient. 11 Students are very convenient, 12 Students are convenient and 2 Students are moderately convenient. In Laptop, 10 Teachers are very convenient, 10Teachers are convenient, and 5 Teachers are moderately convenient. In Smartphone 12 Teachers are very convenient, 12 Teachers are convenient and 1 Teacher is moderately and 7 Students are very convenient,9 Students are convenient and 7 Students are moderately convenient. In E-Book,

Fig.3 Accessing the internet for Teaching-Learning Activities (Teachers)

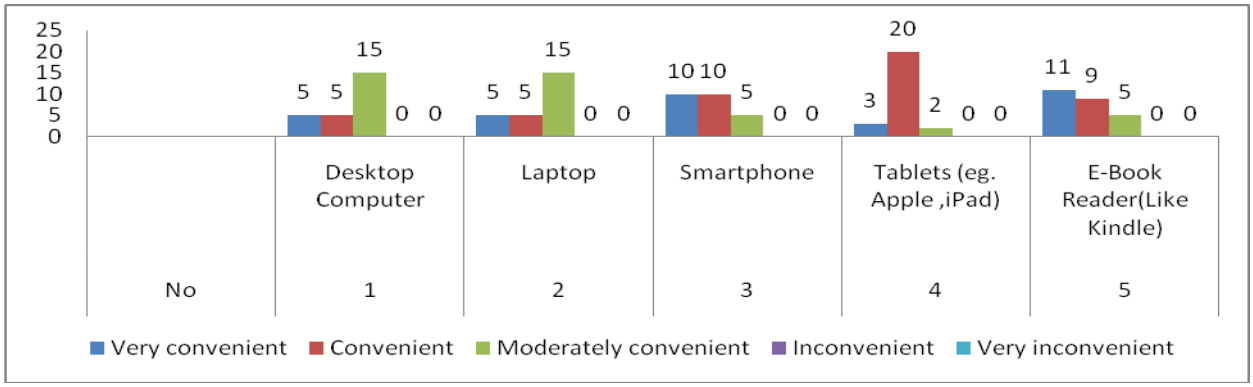


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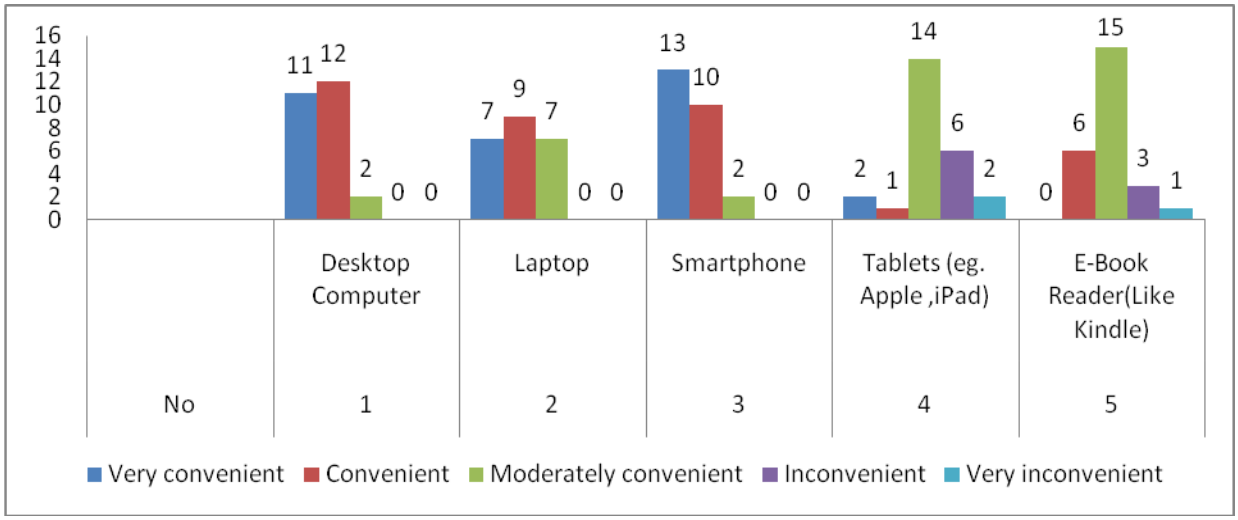
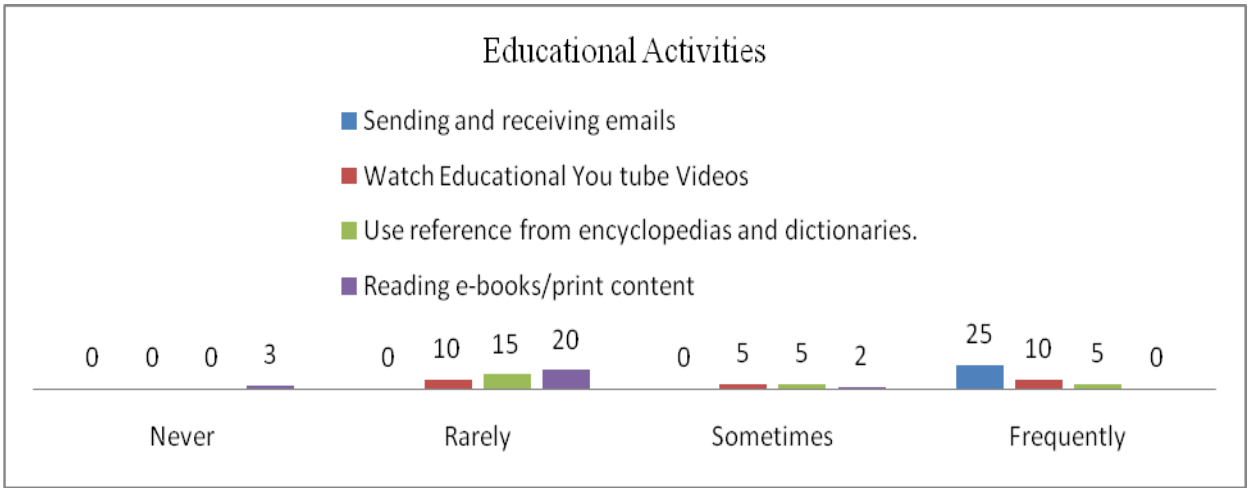
Fig.4 Accessing the internet for Teaching-Learning Activities (Students)



2.Usage of the following educational activities on mobile devices (Teacher)

Fig.5 Usage of the following educational activities on mobile devices (Teacher)



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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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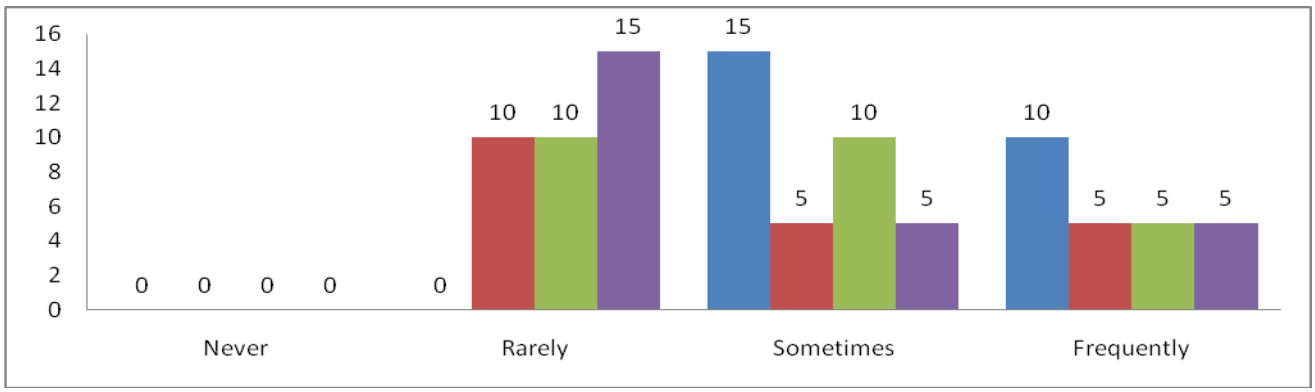
2. Usage of the following educational activities on mobile devices (**Students)**

Fig.6 Usage of the following educational activities on mobile devices (Students)



Part C: Mobile Learning Acceptance

1. Please a tick mark the options given below that best represents your feeling toward mobile learning. (For Teachers)
2. How far do you agree or disagree with the following statements with respect to mobile learning? (For Students)

Fig.7 Feeling towards Mobile Learning for Teachers

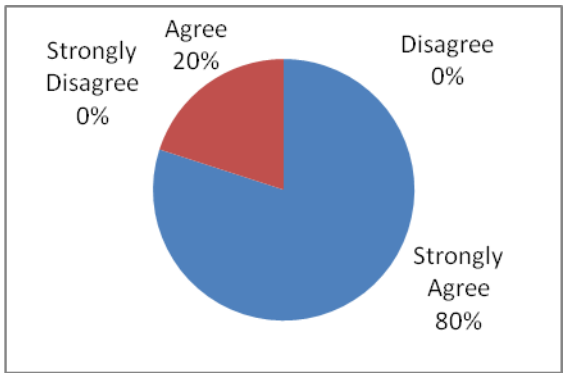


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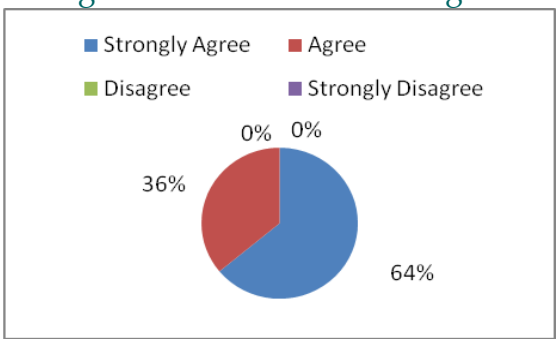
Fig.8 Feeling towards Mobile Learning for Students



Conclusion

The purpose of my Research is to investigate the use of mobile technologies for educational purposes by Teachers and Students during Pandemic Period. Datum is collected from 25 Teachers and 25Students by using Demographics. In Part A, Teachers and Students have answered the questions depend upon their position. In Part B, 0-1 & 2-5 years of Teaching Experience, Teachers mush more used Mobile Technologies than 6-10 years of experienced teachers. Maximized Students are used Mobile Technology in sometimes. Some of the Students are used in Mobile Technology rarely due to Poor Economical Condition. In Part C, 80 % of Teachers are expressed their feeling towards Mobile Learning and also 64 % of Students Expressed their feeling towards Mobile Learning through questioning. For concluding that, due to COVID 19 Pandemic Era, Teachers and Students should have a mobile to flourish the mobile technologies in learning practice. Inadaptability and poor economic conditioned students have a mobile phone for their technological usages of studies. Through the adaptation of Mobile Phone the Teachers can get the knowledge and share their knowledge to their students.

Through this study, the economic perspective reflecting the cost of implementing mobile learning services for Teachers and Students. It will be helpful for developing a new plan and proper budg*et al*location to subsidize billing structure for execution of mobile learning at an organization.

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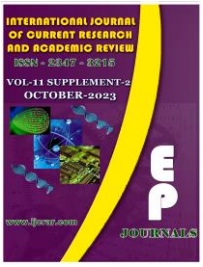

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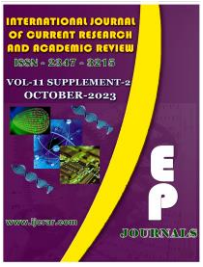

Full Length Article **IJCRAR/FL/21**

Password Cracking by Combining the Two Algorithms are Hash and Salt Algorithm

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Abstract

This article explains password hacking and its algorithm. Passwords are a popular type of username that protects access to files, computers, and network servers. A password cracking attack can be considered a password identity attack. The process of hashing involves the conversion of a password into ciphertext through the utilization of hash algorithms. It is a unidirectional process, rendering the resulting hashing password impervious to decryption. However, it is possible for hacker to attempt to reverse engineer the hashed password. To obscure the actual password, password salting involves the addition of random characters before or after the password prior to the hashing process.The main part of this report will focus about password cracking, hashing algorithm, salting algorithm, combining hash and salt algorithm. And how they steal password hacking is discussed. An implementation of the salt hashing algorithm was developed, along with experimental results on its performance.

Keywords: Password Cracking, Salt algorithm, Hash algorithm.

Introduction

Password cracking, also known as password hacking, is an attack that involves hackers trying to crack or identify a password. Password hacking uses different programming and automation

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International Journal of Current Research and Academic Review

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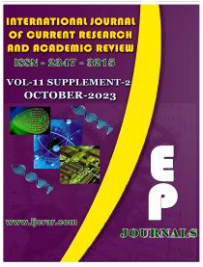

techniques using special tools. These password cracking tools can be called password hacking. Since the beginning of computer passwords, hackers have been trying to crack the passwords, but this has become more popular and useful in the last decade. A common method for cracking passwords is to get a file containing a user's hashed password, then run a cracker on that file to try to get a match for all the hashed passwords, thus revealing the entire password file.

While the latter part is usually quick and uncomfortably easy, the former can be difficult and many steps will need to be taken to access the system's storage to access the password file. However, thanks to easy and targeted Google searches, it has become easy to collect hashes from unsuspecting users.

Literature Review

Wouter Penard - center on the purported vulnerabilities identified in the SHA-0 hash function by various researchers. A hash function is a mathematical function that accepts input of any length and generates a fixed length string known as a ”fingerprint”. This function is commonly employed as an index in a hash table.

Niels Provos - Examines methods for constructing systems in which password security remains effective in light of advancements in hardware speeds. Provided a formal framework for identifying the desirable properties of a robust password system and demonstrate that the computational expense of any secure password scheme must escalate as hardware capabilities enhance.

Alexander D Kent - Review of one-way hashing and relevance theory derived from language, put forth five original contributions that pertain to ad-hoc communications and security. Discussed the utilization of one-way cryptographic hashing as a means to securely communicate in an environment where preexisting shared knowledge is present.

Simon Marechal - An overview of diverse methodologies employed in both public and private tools to augment the password cracking process. As reported by the concerns surrounding

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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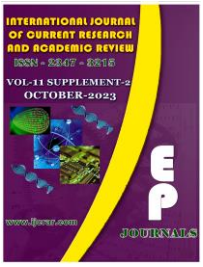
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



algorithmic and implementation optimizations, the utilization of specialized hardware, and the application of the Markov chains tool.

Password Cracking

Password cracking is a technique used to recover passwords from a batch. Password cracking can be done using Wordlist, BruteForce, Dictionary Attack. The motivation behind password hacking may be to help a user recover a forgotten password. Password hacking can be done for two reasons: One reason for password hacking is when a user has entered or forgotten a password. On the other hand, it is accessing the computer without permission without the knowledge of the owner of the computer. This leads to cyber crimes, such as password theft to access banking information. A password is a common type of user name that secures access to files, computers, and network servers. Whenever you can create a password, the password you enter is not saved in the database. Instead, it's about creating a pseudo-random function like a hash function that produces what often looks like pure gibberish but is very useful in security. Instead of a clear text password, its hash is stored in the database.

Algorithm

Hashing algorithm

When a password is not stored, it contains plain text, but is stored with a hash value. A hash function or hashing algorithm creates a unique digital fingerprint of the data. The digital fingerprint of this data is called a digest/message digest/hash value. The hash function feature cannot be reversed because it is very secure like encryption and hashing. Similarly, if you have a hash value, there is no way to return the plain text. For example, MD5 has a hash algorithm, the password will be "abc123" and it will be stored in the database as e99a18c428cb38d5f608865797422eo. Only cryptographic hash functions are used to implement password hashing.

Some examples are MD5, SHA-256, SHA-3, Triple DES, etc. This is an example of a 128-bit MD5 hash algorithm, if the value is one character or more than 50 characters, the size of the hash value is always one. Regardless of the large input, you will get a fixed length hash value. Then it must

International Journal of Current Research and Academic Review
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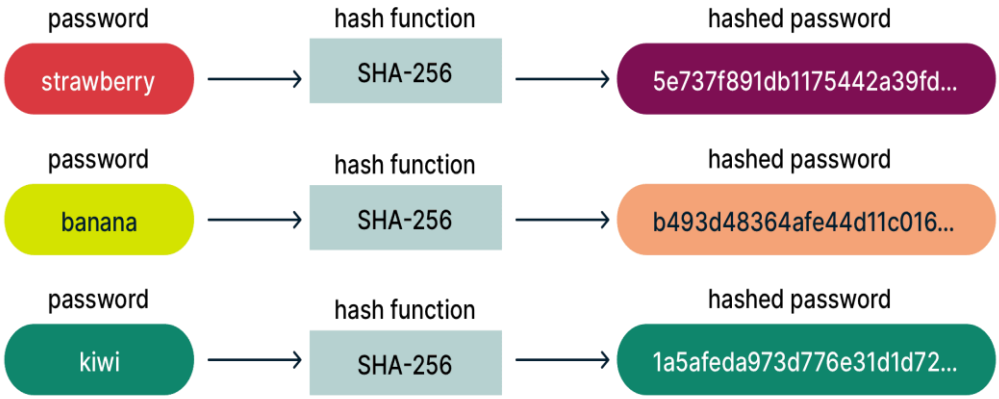
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

be special that since we have a long, sure that a small change in the input data will cause a big change in the hash value of the generator.

Fig.1



Salt algorithm

A salt is random data added to the data before generating the hash code. It usually stores salt in its price range. The salt algorithm helps protect this hashed password against dictionary attacks by introducing randomness again. Password hashing salting involves using random data as input added to the hash function that encrypts the password.

The purpose of the salted hash algorithm is to protect against attacks against dictionary attacks or attacks against passwords using rainbow tables. SCRAM stands for Salted Challenge Response Authentication method that protects passwords against dictionary attacks by adding random ones from the salt. Since the salt is different for every password, they provide a very high level of security for the password.

Each user is assigned a unique salt, which only the server knows, making it unique and secure. A salt can be added to any part of the password. For example, adding a salt to the password "Password" can make the password salt look like "4(j3Li95Password" or "Password4(j3Li95").

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

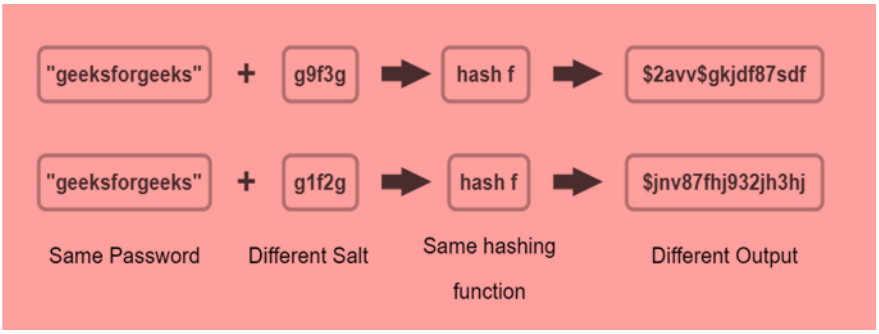
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Once the salt is added, the combination of the text password and the salt dissolves, creating It's more secure than just a password.

Fig.2



Combining Salting and Hashing for Security

Password hashing makes storage and management more secure and applies to both salted and unsalted passwords. A hashed password also makes it harder for bad actors to crack passwords at scale. Since random characters are added to the password before hashing, a hacker loses the ability to understand plain text passwords easily. Without guesswork, it is nearly impossible to take the result of a hash function and reverse engineer it to determine the original value. A unique hash generated with salted passwords protects against attacks including dictionary, brute force and hash table attacks. Let's say a hacker wants to try a password. The hacker must first steal files from the server with hashed passwords. An experienced hacker will already take commonly used passwords, dictionary entries and passwords found on the dark web, run it through a standard hashing algorithm and put the results in a table. A hash table is a pre-computed database of hashes and a hash table is a pre-computed table of hashes used to decrypt password hashes. The hacker scans the server file for matches and hashes compiled in his rainbow table. Since the rainbow table was created from all clear text, they already know this user's password. A hacker will be able to gain access to a user's account unless other security measures, such as multi-factor authentication (MFA), are in place. A hacker with a precomputed table based on common passwords won't be able to easily decipher a salted password because random characters are added. A hacker would be forced to try millions of password-salt

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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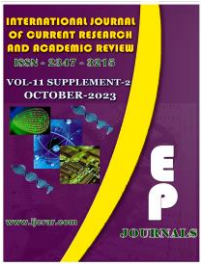
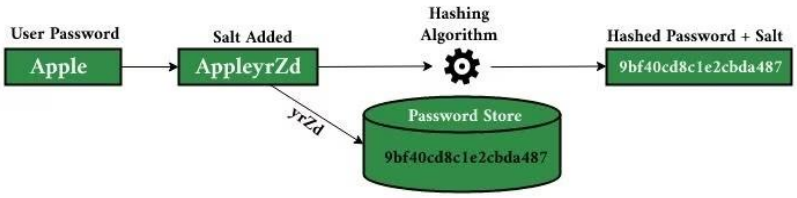
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



combinations to figure out the password. Just as a car thief will avoid a difficult stop to find an unlocked car with the keys in the ignition, a burglar will think about targets who are not safe.

Fig.3



Conclusion

We can conclude that the combination of Hash and Salt algorithm is more secure for password hacking. A salt is a string that is not stored in a cryptograph that is added to the password before it is revealed, and the salt will be stored in the hash, making it difficult for an attacker to know what the plaintext is. -no access to both locations. Hashing a salt is a complex and secure process because each hash requires a different "salt", which acts as an additional mask. This means that any known salt (or aggregate) is required to perform a password hash function.

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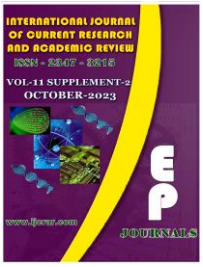

Full Length Article **IJCRAR/FL/22**

Calculus and it's Applications

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Abstract

Calculus, Field of mathematics that analysis aspects of change in processes or systems that can be modled0 by functions. Through its two primary tools—the derivative and the integral—it allows precise calculation of rates of change and of the total amount of change in such a system. The derivative and the integral grew out of the idea of a limit, the logical extension of the concept of a function over smaller and smaller intervals. The relationship between differential calculus and integral calculus, known as the fundamental theorem of calculus, was discovered in the late 17th century independently by Isaac Newton and Gottfried Wilhelm Leibniz. Calculus was one of the major scientific breakthroughs of the modern era. Calculus is a tool used by engineers to determine such quantities as rates of change and areas; in fact, calculus is the mathematical 'backbone' for dealing with problems where variables change with time or some other reference variable and a basic understanding of calculus is essential for further study and the development of confidence in solving practical engineering problems.

Keywords: Calculus, instantaneous rates of change, areas under curves, sequences and series.

Introduction

Calculus is the broad area of mathematics dealing with such topics as instantaneous rates of change, areas under curves, and sequences and series. Underlying all of these topics is the concept of a limit, which consists of analysing the behaviour of a function at points ever closer to a particular point, but without ever actually reaching that point. Calculus has two basic

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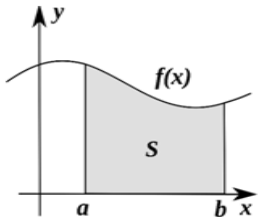
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

applications: differential calculus and integral calculus. Calculus is applied in many areas of life. It can be used to model systems where there is change. Examples of the applications of calculus in scientific fields are space exploration, telecommunications

Fig.1



Application's of Calculus

In Space Exploration

Calculus studies the rate of change, meaning it studies things that move. Objects in space, such as the planets and stars are constantly in motion, so knowing calculus is useful for astronauts when they journey into space. Astronauts use calculus to determine how the spaceship itself moves. It is also used in is used to calculate the velocity, acceleration, and position of objects in space.

For example,

- Calculus is used to determine the rate of speed required for the spaceship to successfully reach space from the Earth
- When launching a spacecraft, calculus is used to calculate the optimal trajectory that will allow the spacecraft to reach its destination using the least amount of fuel.

In Electrical Field

As we move beyond resistor circuits and start to include capacitors and inductors, we need calculus to understand how they work. Think of calculus as a corequisite in parallel with

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

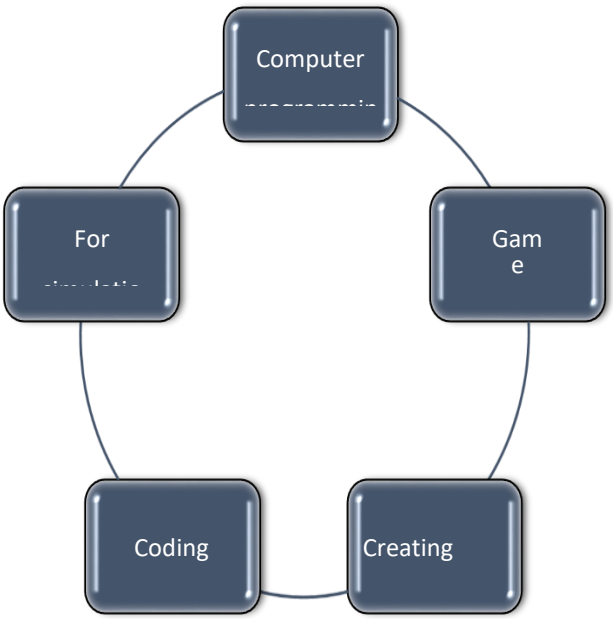
electrical engineering. You don't need to have a complete calculus background to get started, but it is helpful before too long. Many students learn calculus at the same time as introductory electrical engineering classes. Calculus kicks in when we get to circuits involving time—circuits with capacitors or inductors. We have to use calculus to get a meaningful solution.

In Computer Science

Together, these disciplines help you to figure out the rate of change, which is an important ingredient in many algorithms and programs. Differential equations are particularly important. A differential equation calculates how something changes and how fast that happens, so a computer can predict future outputs.

Some of the other application's in computing filled are

Fig.2



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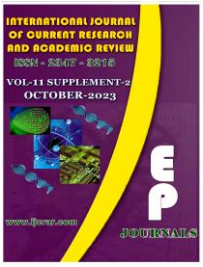

In Engineering

1) Understand the concept of a limit and its significance in rate of change relationships;
2) Use calculus notation for describing a rate of change (differentiation) and understand the significance of the operation;
3) Solve engineering problems involving rates of change
4) Understand what is involved in the calculus operation of integration;
5) Solve engineering problems involving integration.

In Meterology

Storms including Hurricanes, tornadoes, and even cyclones use calculus to predict their direction and intensity. These simplifications do not all correspond to conditions in the atmosphere, so many more equations are used besides this one that are solved by calculus. Anemometers to know the speed of wind. Weather balloons are very useful to predict all of the above thing in the layer of troposphere. Radar measures precipitation. All of the above data collected and put in the numerical weather prediction computers that use the calculus started to predict the weather. Vector calculus plays very important role in predicting tornadoes:

It displays following things:

- Wind as Vector fields.
- pressure and humidity as scalar field

In Business

Business we come across many such variables where one variable is a function of the other. For example, the quantity demanded can be said to be a function of price. Supply and price or cost and quantity demanded are some other such variables. Calculus helps us in finding the rate at which one such quantity changes with respect to the other. Marginal analysis in Economics and Commerce is the most direct application of differential calculus. In this context, differential calculus also helps in solving problems of finding maximum profit or minimum cost etc., while

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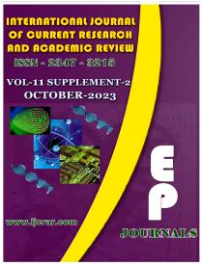

integral calculus is used to find he cost function when the marginal cost is given and to find total revenue when marginal revenue is given.

To studying the application of calculus, let us first define some functions which are used in business and economics.

Conclusion

Moreover, calculus is a language of mathematicians, physicians, economists, biologists, architects, medical experts, and it is often used by them and also in all the fields of science. Some of the concepts of science are beautifully modelled and explained, such as birth and death rates, derivatives, integrals, heat and light, motion, electricity etc. with the help of calculus. The Quantitative data in finance also uses multivariable calculus to estimate future trends in the stock market and is also used in optimal control of a continuous-time dynamic system

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E-resource

https://www.britannica.com/science/calculus-mathematics

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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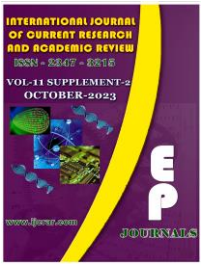

Full Length Article **IJCRAR/FL/23**

Data Science Methodology for Cyber Security Project

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Abstract

Solutions for cybersecurity are typically static and signature-based. The traditional approaches could be enhanced by automatically triggering mitigation or by providing pertinent awareness to control or restrict the effects of risks. Analytic models, machine learning, and big data could also help in this manner Data Science for Cybersecurity is discussed in the perspective of intelligent solutions. Data science offers a Utilizing data (particularly big data) and high-performance computing, cybersecurity plays an information technology, data mining, and machine learning help defend users against online crimes. To do this, a successful data science project needs an efficient process that addresses all problems and allocates enough resources. We introduce common data science approaches in this paper and will compare them in light of cybersecurity issues. A discussion of comparisons has also given to clarify the advantages and disadvantages of techniques in the context of cybersecurity initiatives.

Keywords: Cybersecurity, data science methodology, triggering, high performance computing, information technology, data mining, machine learning, techniques, online crimes.

Introduction

Now-a-days a man able to send and receive any form of data may be an e-mail or an audio or video just by the click of a button but did he ever think how securely his data id being transmitted or send to the other person safely without any leakage of information. The answer lies in cyber

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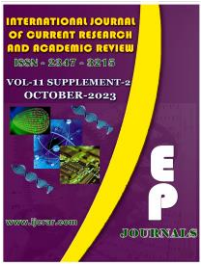

security. Cybersecurity refers to set of techniques used to protect the integrity attack, damage or unauthorized access.

Information technology security, also known as computer security, cyber security, or digital security, is the safeguarding of computer systems and networks against intrusions by malicious actors that could lead to the theft or damage of hardware, software, or data, as well as the disruption or rerouting of the services they offer.

The National Institute of Standards and Technology has created a framework based on the data analysis potentials in cybersecurity that includes asset risk identification (and threat repercussions), information protection, invaders detection, responding to intruders, and business continuity planning.

The process of recuperation. Cybersecurity, High-performance computing, data mining, and machine learning are used in conjunction with data (including big data) safeguard users against online crimes. In order to achieve this, a good data science project needs an effective approach to address every issue and provide sufficient resources. The overall overview of data science is described in relation to cybersecurity problems.

Literature Review

Foroughi, Farhad [1]: Solutions for cyber-security are often static and signature-based. The traditional approaches could be enhanced by automatically triggering mitigation or by providing pertinent awareness to control or restrict the effects of risks. Analytic models, machine learning, and big data could also help. The topic of data science for cyber-security includes several intelligent solutions. By utilizing the power of data (including big data), high-performance computing, and data mining (and machine learning),

Foroughi & Luksch.P [2]: Data science is essential to cyber-security since it protects people from online crimes. A good data science project must have an effective methodology that handles all issues and allots sufficient resources in order to accomplish this. We introduce the most popular data science methodologies in this post and contrast them in light of the current cyber security concerns. One without boundaries

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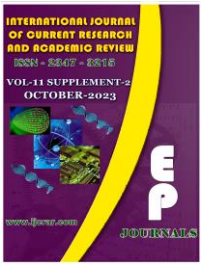

Sarker, Iqbal H., [3]: While numerous research initiatives have been made in the direction of cybersecurity solutions, as addressed in the "Background," "Cybersecurity data science," and "Machine learning tasks in cybersecurity" sections in various ways, this paper offers a thorough overview of cybersecurity data science. In order to grasp cybersecurity data, different defense measures, including intrusion detection approaches, and various machine learning algorithms in cybersecurity activities,

Heard, Nicholas A., [4]: The development of cyber defenses is an exciting new growth sector made possible by new data science techniques. Data science methods hold the promise to detect such behaviors from the huge collections of cyber traffic data sources that may be gathered. Networks of connected devices, such as enterprise computer networks or the broader so-called Internet of Things, are all susceptible to abuse and attack.

Iqbal.H, sarker [5]: Artificial neural network (ANN), is one of the major technologies of today's smart cybersecurity systems or policies to function in an intelligent manner. Popular deep learning techniques, such as multi-layer perceptron, convolutional neural network, recurrent neural network or long short-term

S. M. Kayes[6]: To improve decisions, cut expenses, or enable more efficient processing, one might employ potential tactics including parallelization, divide-and-conquer, incremental learning, sampling, granular computing, feature or instance selection. In these situations, the idea of cybersecurity data science, in particular machine learning-based modeling, could be useful for the automation of processes and decision-making for intelligent security solutions. Researchers could also take changed algorithms into consideration.

Zhong (2018), [7]: Python cleaning and classification methods were used to analyze RFID datasets for automated manufacturing workshops. By providing an integrative framework to enhance comprehension of the circular economy (CE) and a relational matrix to highlight the difficulty of large-scale data handling.

Neeraj bhargaya, Ritu Bhargava [8]: Virtually every aspect of modern life is influenced by artificial intelligence (AI), including games, language learning, speech recognition, insight

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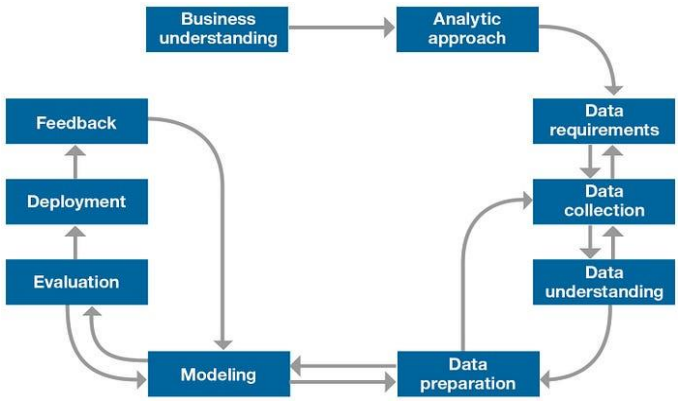
robotics, financial transactions, and many more areas. Governments, banks, and organisations now face a serious security concern as a result of online software engineering ambushes. Cybersecurity and AI have grown in importance as time has gone on, but AI is suffering as it is a dynamic and delicate subject related to human existence.

Data Science Methodology

To address the issues in data science, every data scientist needs a methodology. As an illustration, say you are a data scientist and your first task is to help a business enhance sales. The corporation wants to know which products to market when. In order to organize your job, examine various sorts of data, and resolve their issue, you will require the appropriate technique. Your client doesn't care how you complete the task; all that matters is that you complete it on schedule**.**

Fig.1



The extracted knowledge is important to aid the decision-making process in a specific application, data science requires careful thought and result evaluation the environment in which it is employed. Usually, it gives information about data elements that supply information about other data items, in particular, acknowledged quantities that uncertainty about unknowable quantity Entities that are identical in terms of well-known characteristics or properties are frequent identical in terms of unidentified characteristics or qualities. Calculating pattern similarity acknowledgement.

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Application of Cybersecurity

Cybersecurity is just a moral practice that aims to make our equipment safer and protected from such hackers. People who work in cybersecurity carry out security procedures and operations to protect our equipment and data. Protecting our network, devices, and data against unauthorized and illegal access by other parties is the main focus of cybersecurity. Hackers and other cybercriminals utilize the Internet as a means of carrying out cyberattacks, installing spyware, and otherwise breaking into other people's electronic equipment.

DDoS security

Distributed Denial of Service is referred to as a DDoS attack. In this cyberattack, the attacker employs numerous devices to keep the web server busy processing his requests from the various devices. On the server, it generates fictitious website traffic. To address this, cybersecurity offers a DDoS mitigation solution that helps manage it and resolves the issue by redirecting traffic to other cloud-based servers.

Antivirus and Antimalware

Cybersecurity is used to create antivirus and antimalware software that guards against all types of online threats to computers and shields them from unauthorized hacker attacks, data breaches, and other online threats. Additionally, it aids in maintaining firewall and network security systems for all connected devices.

Fig.2 Cybersecurity application

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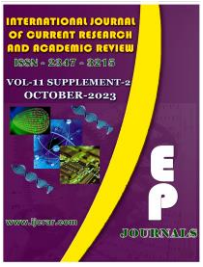

The main goal of cybersecurity is to safeguard all Internet users from malicious software, infected files, and other digital attacks that could allow users to access their private information, demand ransom payments using that information, or even disrupt vital infrastructure.

Cybersecurity Types

Information Security

Protecting user privacy from hackers and cybercriminals is the major goal of information security. It stops data theft as well as the situation when hackers demand a ransom from consumers in exchange for their private data. In essence, it covers cryptography, user authorization, and authentication.

Network Security

Primarily focuses on defending the integrity and safety of the network components utilized by users and preventing denial of service attacks, which prevent authorized users from using the computer network. It comprises products like VPNs (Virtual Private Network), firewalls, and antivirus software.

Application Security

Application Security is the process of shielding the computer system's apps and programs from potential hacking risks and vulnerabilities that may arise due to

Malware in Cybersecurity

Malware is any software that is purposefully created to disrupt a computer, server, client, or computer network, leak confidential information, gain unauthorized access to data or systems, prevent access to data, or inadvertently compromise a user's privacy and security online.

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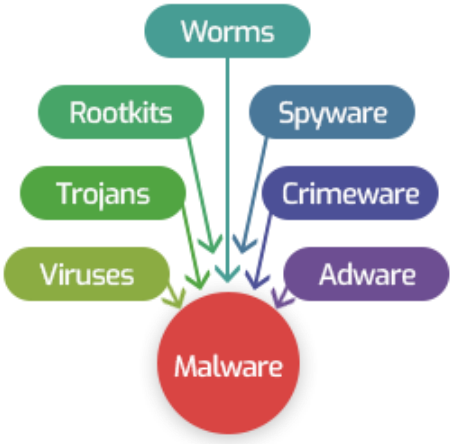
Fig.3 Malware in cybersecurity



Malware, short for malicious software, is any intrusive software created by cybercriminals (often referred to as hackers) in order to steal data and harm or completely destroy computers and computer systems. Malware types that are frequently encountered include worms, Trojan horses, spyware, adware, and ransomware. Massive amounts of data have been exfiltrated recent malware attack.

Defining cybersecurity data science

Any intrusive software designed by cybercriminals (often referred to as hackers) to steal data and damage or entirely destroy computers and computer systems is known as malware, short for malicious software.

To do this, a number of data-driven tasks, Including-Finding insights or incident patterns or knowledge from data is the focus of (i) data engineering, (ii) data volume reduction, (iii), targeted security alerts, and (iv) discovery and detection. Automated models concentrate on developing data-driven intelligent security modals, and discovery and detection concentrates on extracting insight or incident patterns or knowledge from data.

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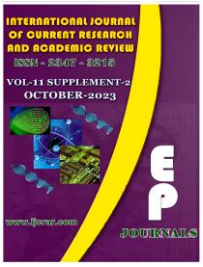

Conclusion

The framework consists of several data collecting, data preparing, data preparation, machine learning based security modeling, and incremental learning and dynamism learning and dynamism for smart cybersecurity systems and services. We specifically focused on extracting insights from security data, from setting a research design with particular attention to concepts for data-driven intelligent security solutions.

Overall, this paper aimed not only to discuss cybersecurity data science and relevant methods but also to discuss the applicability towards data-driven intelligent decision making in cybersecurity systems and services from machine learning perspectives in our journey so fa we have encountered a number of challenges that have led to many lessons and ideas for the future.

For the Problem of limitation number of malicious examples, we think that can model the historical 'normal' behavior and detect any suspicious deviations from it. Data processing made us aware that there are many ways to standardize cyber data and that the choice of method can directly affect the results. We also found that in order to further understand and improve your models, it may be necessary to work closely with cyber domain experts, sharing thoughts on progress so far and analyzing corner cases together.

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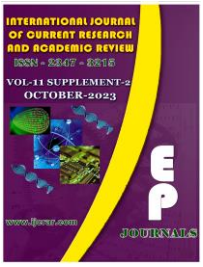

Full Length Article **IJCRAR/FL/24**

Essence for Internet of Things

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Abstract

IOT is a special platform which plays an important part in day-to-daylife, because of developments in technology, which has been suitable to get linked to everything. This particularity of being linked has performance a huge compass of development. TheIOT gives the chance erect effective administration applied for manufacture, lifesaving result proper civilizationand more. This paper overview of IOTtechnology and it has various operation. In recent times, circular business models (CBM) have come into a cataclysmal condition to foster advancements in environmental performance. However, the current literature rarely discusses the link between the internet of goods (IOT) and CBM. This paper first identifies four IOT capacities, including monitoring, shadowing, optimization and design elaboration for perfecting CBM performance predicated on the fraudulent framework IOT played a virtual part in this business middle singly through taking, monitoring and optimization. Technology with jumbled operations adoption in innumerable fields one analogous field is healthcare. Each knot in the IOT scanner and senses the girding terrain to collect the data and transfer it to an operation andgain intelligence. The position of consonance mechanization and comfort for mortal life will increase through being IOT and future IOT openings. IOT can achieve better security with blockchain integration but needs to address various challenges to successfully apply IOT with a nippy increase in IOT operation demands, insulation, promising security and verification for all entire deals in the network and the system should be suitable to recover from any kind of attack.

Keywords: Abdication, IOT operation, optimization, condition-based maintenance (CBM), sequestration.

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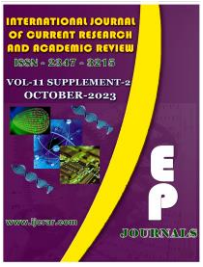

Introduction

IOT is a vital network framework which proposes to fuse physical and effective domains by utilizing the internet as a medium for communication and transferring of data between them. The "IOT" was formulated in 1993 by Kelvin Ashton. IOT forms a periodic circumstance which combines and the usage of sensors to create medium and sense and users and a network to communicate with accumulation and the standard provides a machine with supplemented intelligence which helps to examine behavior and act according to a situation.The internet of things in and network of physical objects, devices, instruments, vehicles, buildings and other items embedded with electronics, circuits, softwaresensors, andnetwork connectivity that enable this object to collect and exchange data. The concept of a network of devices was discussed in 1982 with a modified machine at carriage university becoming and the first them without human intervention. The development of IOT involves many issues such as infrastructure, communication, interface, protocols and standardwere generally defined as dynamic global network infrastructure with self- configuring capabilities based on standard and communication protocols. The birth of the internet in the early 1990s, attempts were made to connect "things" with the internet. In 1990, JOHN ROMKEY created the first internet device and in 1997 PAUL SAFFO gave the first brief description of sources and how it could be used in connection with the Trent of the next internet The IOT is one of the appearing rapidly growing technology provides that added electronic sensors to collect the surrounding data and a network module to provide communication and intelligence among physical objects.In general, end-user adoption of IOT applications is healthcar3e is very how the world today is no more communicating separately, rather devices are automatically communicating with each other and providing various services. Health care can be supplementary and avoided with the inclusion of IOT based devices to help both patients had healthcare professionals equally.

Literature Review

Suiting Ding, Arnold Tukker, Hauke Ward "Opportunities and risks of internet of things (IOT) technologies for circular business models" the author prescribed the concept of a network of devices was discussed in 1982 with a modified machine at carriage university becoming and the first them without human intervention. DeMedeiros, K.; Hendawi, A.; Alvarez, M. A Survey of

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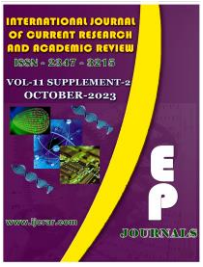

AI-Based Anomaly Detection in IoT and Sensor Networks This paper extensive overview of that IOT technology and it has various operation. The IoT hardware, software and protocol energy consumption, interoperability, security and financial investment might become main obstacles for the wider use of IOT in CBM. Sumitha Kumar, Amarsinh vidhate "issues and future trends in IOT security using blockchain": A review a published in 2023 international conference on intelligent data communication technologies and internet of things (IDCIOT) discuss about it. The IOT is one of the appearing rapidly fast technology data and communication. Where every physical "thing" or "node" is submerge with a digital element and working in a network data and a network module to provide communication and intelligence among physical objects.

Luliana chiuchisan, Hariton-nicolae costil, oana geman " Adopting the internet of things technologies in health care system", published in 2014 international conference and exposition on electrical and power engineering (EPE) described IOT based healthcare systems plays a siginificant role in information and communication and technologies and as contribution in development of medical information systems.

Asim maharjan and saju khakurel this paper discussed about "introduction to internet of things", refers to a network of inter connected physical devices, objects, or "things" that are immerse with sensors, software, and other technology enabling them to collect and exchange data with each other and with centralized system or platforms over the internet.

Applications of IOT

1. Smart Homes

IOT devices in homes allow for remote control and automation of lighting, appliances, security, and more.

2. Industrial IOT

IOT is used in factories and industries for real-time monitoring and optimization of machinery and processes.

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3. Healthcare

IOT aids in remote patient monitoring, wearable health devices, and smart medical equipment for improved healthcare.

4. Agriculture

IOT sensors help with precision farming, monitoring soil conditions, and optimizing crop production.

5. Smart Cities

IOT enhances urban services, including traffic management, energy efficiency, and public safety.

6. Transportation

IOT is used for vehicle tracking, logistics optimization, and providing real-time transit information.

PROS and CONS

Pros of IOT

Efficiency and Automation

IoT can automate various tasks, reducing human intervention and improving efficiency. This is particularly valuable in industrial and business applications.

1. Data Collection and Analysis

IoT devices can collect vast amounts of data, which can be analyzed to gain insights and make data-driven decisions. This is crucial for improving processes and services.

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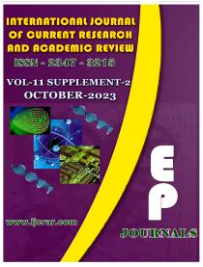

2. Improved Safety

IoT devices can enhance safety by monitoring and controlling potentially hazardous situations in real-time, such as in smart homes and industrial settings.

3. Remote Monitoring and Control

IoT enables remote monitoring and control of devices and systems, allowing for management from anywhere with an internet connection.

4. Environmental Benefits

IoT can be used to monitor and manage environmental conditions and resources more efficiently, contributing to sustainability efforts.

Cons of IOT

1. Security Concerns

IoT devices can be vulnerable to hacking and security breaches. Weak or default passwords and inadequate security measures can expose sensitive data and pose risks.

2. Privacy Issues

The vast amount of data collected by IoT devices can raise concerns about privacy, as users may not have full control over their personal information.

3. Data Overload

The sheer volume of data generated by IoT devices can overwhelm organizations and lead to difficulties in processing and analyzing the data effectively.

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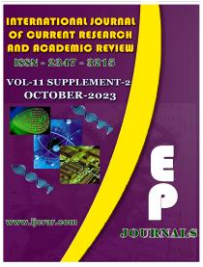

4. Reliability and Maintenance

IoT devices are susceptible to hardware and software failures, and they require regular maintenance and updates to remain functional and secure.

5. Energy Consumption

Some IoT devices may consume a significant amount of power, which can be a concern in applications where energy efficiency is crucial.

IOT Tools

The collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves with IOT tools as in fig:1.

Fig.1 IOT tools

Conclusion

This study has evaluated that the state of the art and CBM from several perspectives. The IOT also provides visual and disappearoptions has service solutions rather than physical products

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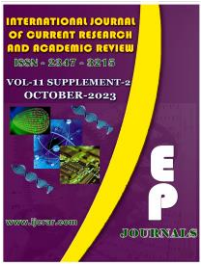

with similar functions to achieve design evaluation capability. In addition, IOT can help to minimize waste generation and enhance efficiency of resource use. In previous year IOT has been developed rapidly and a large number of enabling technologies have been proposed. The IOT has been the Trent of the next internet. IOT is an ideal emerging technology to influence this domain by providing new involving data and the required computational resources for creating revolutionary appframework enabled by a scalable cloud to provide the capacity to utilize the IOT. The frame work allows networking, computation, storage and visualization themseparate there by allowing independent growth in every sector but complementing each other in a shared environment.

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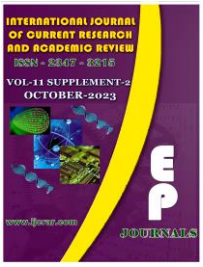

Full Length Article **IJCRAR/FL/25**

An Analysis on the Methods of Machine Learning for Intelligent Systems

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Abstract

The main reviews of the literature on machine learning systems for intrusion detection and network analysis are compiled in this paper. Additionally, each machine learning strategy is briefly described in each session. This study was conducted because data is crucial to machine learning techniques. Machine learning methods are the main instruments for analyzing network traffic and identifying abnormalities, and the study focuses on the datasets used in these methods. This study looks at the various benefits (reasonable uses) that machine learning has enabled, notably for security and cyber-physical systems, such as improved intrusion detection methods and judgment precision. Additionally, this study explores the challenges of using machine learning to cybersecurity and makes recommendations for future research.

Keywords: Machine Learning, cyber physical systems, cyber intrusion detection.

Introduction

Applications for cyber security are examined in this paper, which also reports findings from a review of the literature on data mining and machine learning methods. Additionally, it covers how to apply data mining or machine learning techniques to issues with cyber intrusion detection

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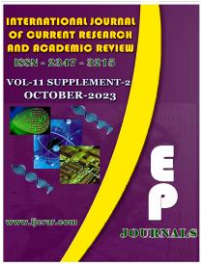

[1]. In addition to assessing the difficulty of various algorithms for data mining or machine learning, the study offers a set of comparable benchmarks for these techniques. The features of the cyber issue are then used to give best practices and a set of recommendations[2]. The phrase "cyber security" refers to a collection of strategies and instruments intended to prevent unauthorized persons from entering computers, networks, data, and applications, assaulting them, or otherwise altering or destroying them.

This survey study places a focus on machine learning or data mining systems while emphasizing the methodologies (ML, DL, and DM) and their descriptions. [3]. Along with several evaluations, a number of papers incorporating these strategies have also been released. The articles that match the predetermined criteria will be the primary emphasis of our paper in compared to earlier evaluations. Methods including "machine learning," "cybersecurity," and "data mining" were used to search Google Scholar. High-cited papers using well-known approaches were one of the main issues [4]

Methodology

Using computer software, machine learning applications offer a novel approach to solving fundamental scientific and technical problems [5]. Over the past 20 years, machine learning has advanced significantly, making it possible for beginners to utilize these tools with ease.

Essentially, a "black-box" lab setting was employed. Commercial enterprises are gradually using machine learning widely since it has become a useful application. Robotics, speech recognition, natural language processing, computer vision, and other cutting-edge applications are among the software developments in machine learning. It is simpler for machine learning developers to train a system than to build the typical input-process-output architecture. By creating simulations of expected events, they do this [6].

During machine learning training, testing, or inference from a data-driven perspective, a thorough literature analysis of defensive tactics and security issues was provided. Moreover, knowledgeable of the issues with supervised learning and reinforcement learning in artificial

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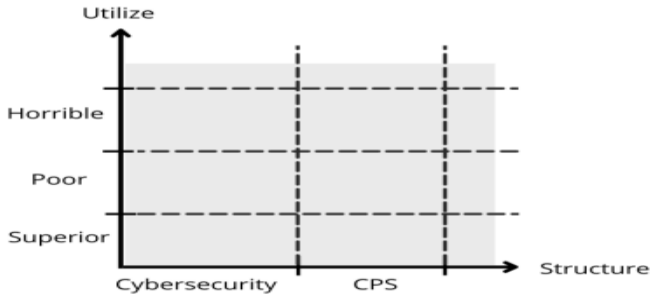
intelligence security. On the other hand, updates on security problems and fixes were looked into throughout the training and inference phases of a machine learning-based system [7].

Fig.1 Interconnection between cyber security education and Cyber physical systems (CPS)



The term "use of machine learning" refers to the moral or beneficial application of machine learning to improve task-specific performance or the development of beneficial applications. Similar to "good" machine learning, "bad" machine learning is defined as potential risks throughout the Data collection, preprocessing, training, deployment, and decision-making processes, as well as training procedures (i.e. training, testing, validation, and implementation). These are vulnerable to exploitation and subversion, resulting in decision-making and machine learning models that are inaccurate or completely unreliable[8].

CPS Machine Learning

Machine learning may be used in CPS to handle control, networking, and computing challenges in addition to cybersecurity. This section will examine recent studies using machine learning for CPS, then discuss challenges and future research directions.

Resolving CPS Security Issues

Security and privacy are given top priority in CPS systems and applications. Effective and long-lasting security measures are required due to the critical infrastructures that Industry 4.0, smart homes, smart grids, and many other applications of the "smart world" monitor and regulate.

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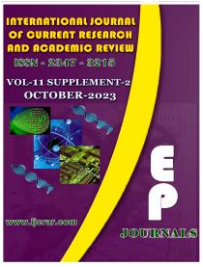

Cyberattacks against CPS frequently have similar traits, such as fake data injection attacks, sometimes called data integrity attacks, which aim to trick the targeted CPS, including the smart grid and the smart transportation system, among others, by modifying or introducing false data. Malicious data samples will inevitably be obtained as the extent of data distribution and collection inside CPS expands. Massive input datasets may be analyzed by machine learning technology, which will improve CPS due to their superior analytical abilities, security. By feeding machine learning algorithms with damaging information or identifying traits as inputs, we may teach them to recognize cyberattacks. Deep reinforcement learning was used by CPS An *et al.*, to develop a system for finding data integrity breaches in the AC power grid.

Using Machine Learning for CPS Safety: Challenges

In general, a number of requirements must be satisfied before building an effective machine learning model. Striking a balance between powerful detecting skills and resource utilization is crucial. Furthermore, machine learning models need to be given timely, relevant, and high-quality data in order to produce accurate findings. Data streams also offer consistent input for real-time detection, but they are difficult to validate in real-time. Malware and dangerous code are becoming more and more difficult to identify and detect due to their diversity and quick expansion. In an hour, malware can infect 3 million additional samples, and certain evolving attacks can launch at various speeds while avoiding end-point detection.

Performance Enhancement for CPS

Keep in mind that machine learning has demonstrated an amazing ability to evaluate data and offer unparalleled insights and knowledge. It's obvious that theMachine learning has the potential to be employed in many different systems for a wide range of purposes, including wireless networks, intelligent transportation systems, the smart grid, image and video recognition, and others. Additionally, machine learning can be utilized to increase network and control system automation. Several recent studies have attempted to employ artificial intelligence in CPS. A lot of focus has been placed on network scheduling optimization. To improve the performance of the IoT system network, Jiang *et al.*, investigated available machine learning techniques and used a variety of learning techniques. Only a few of the other machine learning applications that benefit

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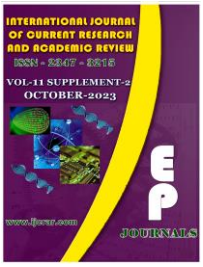

CPS operations include co-design or integration of networking and control elements in industrial IoT, energy production and monitoring, traffic congestion avoidance, and a few other applications.[9].

The Difficulties of CPS Machine Learning Utilization

How to enhance deep learning models and systems to reduce the amount of computing required and increase the efficacy of distributed learning are significant issues being explored at the moment. Additionally, the creation of distributed machine learning error recovery techniques is required since the The stability of deep learning models in edge computing infrastructures is essential [10]. The types, quantities, and forms of input data for machine learning models are specifically constrained [11], to name just a few restrictions. Although CPS collects huge amounts of data, the data's quality cannot be ensured, in part because it is Uncertain how long new IoT technology will last. Machine learning systems either need to be able to deal with such unstructured data and noise naturally or be able to convert unstructured data into a predetermined data format, which is a costly process.

Conclusion

Protection against computer system attacks is a crucial issue for both national and global security. A study of security issues employing various machine learning techniques is presented in this article. Numerous research have employed a range of datasets. Additionally, machine learning and artificial intelligence are crucial components of computer system security. Considerable groups of varied datasets were constructed, together with their advantages and disadvantages, using the sample articles that explain various machine learning and data mining techniques in cyberspace. This work will enable open access to a new dataset in the future.

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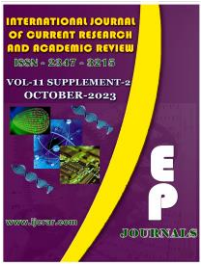

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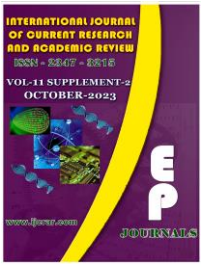

Full Length Article **IJCRAR/FL/26**

Enhancing Crop Yield Prediction by Machine Learning and Deep Learning Techniques

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Abstract

Agriculture is the backbone of human civilization, providing sustenance and livelihoods across the globe. However, with the growing global population and climate change, there is an increasing need to optimize crop yield production to ensure food security. In this work, the application of machine learning (ML) and deep learning (DL) methodologies in computer science has emerged as a promising approach for addressing the challenges faced by modern agriculture. This work explores the significant contributions of ML and DL techniques in enhancing crop yield production. Through data-driven insights, farmers can optimize resource allocation, minimize waste, and maximize crop yield.

Keywords: Deep Learning, Machine Learning, Convolutional Neural Networks.

Introduction

Deep learning, a subset of ML, has further revolutionized crop yield prediction by leveraging neural networks to extract intricate patterns from complex data sources such as satellite imagery and drones. Convolutional Neural Networks (CNNs) are particularly effective in analyzing high-resolution images of crops to detect diseases, pests, and nutrient deficiencies. These DL architectures facilitate the development of predictive models that forecast crop yields with high

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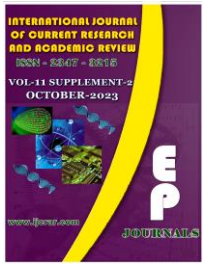

accuracy, empowering farmers to plan for the future and make informed decisions. This allows for dynamic adjustments in irrigation, fertilization, and pest control, leading to improved resource utilization and increased crop yield.

Literature Survey

Chlingaryan, A., *et al.,* (2018) analyzed the use of machine learning techniques in the field of precision agriculture, specifically for crop yield prediction and nitrogen status estimation. The authors examined various studies and research efforts that have utilized machine learning algorithms. It highlights the importance of data-driven approaches in modern farming practices and discusses the challenges and prospects of the technology in agriculture.

Van Klompenburg, T., *et al.,* (2020) provided a comprehensive overview of the state-of-the-art in using machine learning for crop yield prediction, highlighting the importance of this research area in modern agriculture and offering insights into the challenges and opportunities for future developments in the field.

Pushpanatha, K., *et al.,* (2021) presented a thorough review of the state of the art in using machine learning for medicinal plant recognition, emphasizing its potential benefits, challenges, and avenues for future research.

Zheng, A., *et al.,* (2018) projected an overall guide that equips data scientists with the knowledge and techniques needed to effectively engineer features from data.

LeCun, Y., *et al.,* (2015) discussed the fundamental concepts of deep learning, such as neural networks, deep architectures, and the use of multiple layers of artificial neurons to learn hierarchical representations of data.

Khaki, S., *et al.,* (2019) provided specific details about their approach to crop yield prediction using deep neural networks, including the dataset used, the neural network architecture, and the results they achieved. According to the computational findings by the author, this model performed noticeably better than other well-liked techniques like Lasso, shallow neural networks

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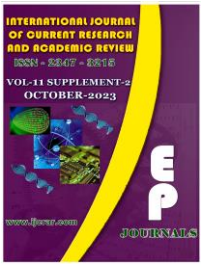

(SNN), and regression trees (RT). The outcomes also showed that environmental factors affected crop production more so than genetics.

Methodology

Agriculture is undergoing a technological transformation with the adoption of intelligent systems based on machine learning and deep learning. However, several domain-specific challenges must be addressed to fully harness the potential of AI in agriculture as in Fig (1).

Fig.1 Key Challenges for Intelligent systems in agriculture

Crop Yield Prediction and Optimization

Accurate crop yield prediction under varying environmental conditions is essential for farmers to make informed decisions and plan their agricultural activities effectively. By leveraging artificial intelligence and advanced data analytics, one can develop models that take into account various environmental factors such as temperature, rainfall, soil fertility, and pest infestation to predict crop yields with increased accuracy. To achieve optimal resource allocation for maximizing yield while minimizing inputs, AI can assist in analyzing and optimizing the utilization of key resources such as water, fertilizers, and pesticides.

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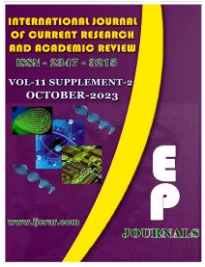

Pest and Disease Management

Early detection and identification of pests and diseases is crucial in managing agricultural systems effectively. AI technology can play a significant role in this area by utilizing various sensors, imaging techniques, and machine-learning algorithms. These AI-powered systems can constantly monitor fields and crops, detecting the early signs of pest infestations or diseases, before they spread extensively.

Soil Health Monitoring

Soil quality assessment and monitoring play a vital role in promoting sustainable farming practices. By understanding the health of the soil, farmers can make informed decisions about nutrient management, erosion prevention, and water conservation.

Climate Resilience and Adaptation

Climate modeling and prediction play a crucial role in developing adaptive farming strategies. By using advanced computer models and observational data, scientists can simulate future climate scenarios and predict changes in temperature, rainfall patterns, and other key climatic variables.

Data Integration and Interoperability

By collecting and integrating data from different sources such as weather stations, soil sensors, satellite imagery, and crop yield monitors, a comprehensive view of the agricultural ecosystem can be obtained. One of the key challenges in data aggregation is ensuring that the collected data can be seamlessly exchanged and shared across different platforms and systems. This requires the development of interoperable platforms that can translate and standardize data formats, making it easier for different systems to communicate and integrate.

Smallholder Farmer Adoption

Tailoring AI solutions for the needs and constraints of small-scale farmers is crucial to promoting agricultural innovation and productivity. Small-scale farmers often face unique challenges such as

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limited financial resources, lack of technical skills, and inadequate access to information and resources.

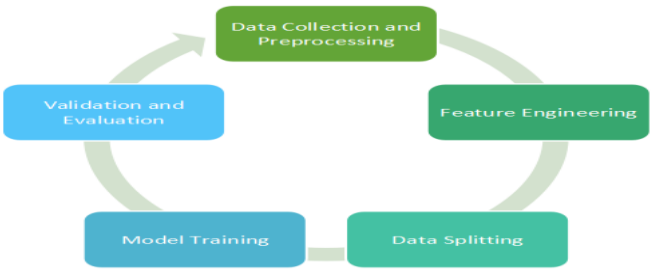
Ethical and Environmental Considerations

Ensuring responsible AI use to avoid over reliance on technology. Educating people about the limitations and potential risks of AI can empower them to make informed decisions and not blindly rely on technology for all tasks.

Taking on the Difficulties

Crop yield prediction and optimization using machine learning algorithms involve leveraging historical and real-time data to develop models that can forecast crop yields accurately and suggest optimal practices for improving those yields. A general overview of the proposed framework using machine learning algorithms is depicted in Fig (2).

Fig.2 Block diagram of the proposed framework



Data Collection and Preprocessing

To gather historical data on crop yields, weather conditions, soil properties, and agricultural practices, one needs to identify reliable sources. Access the relevant datasets from the identified sources. Gather data for the desired period, geographical region, and crops of interest. Validate

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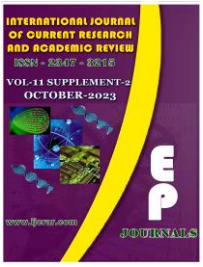

the cleaned and pre-processed data to ensure its quality and reliability. This prepared dataset will serve as a solid foundation for subsequent analysis and modeling tasks in the agricultural domain.

Feature Engineering

Temperature plays a crucial role in determining crop growth and development. Higher temperatures can accelerate crop growth in some cases, but extreme heat can also negatively impact crop yield. Including crop type as a feature enables modeling specific crop-yield relationships, accounting for crop-specific characteristics and responses to environmental variables.

Data Splitting

Splitting the dataset into training, validation, and test sets is crucial for evaluating the performance of machine learning models effectively. The test set is used to evaluate the final performance of the trained model. It should be independent of the training and validation sets and should resemble the real-world data.

Choose Appropriate Machine Learning Algorithms

Deep learning has gained significant attention in recent years due to its ability to automatically learn relevant features from raw data. When approaching a machine learning problem, it is important to consider the complexity of the problem and the size of the dataset. Deep neural networks, with multiple layers of interconnected nodes, can solve complex tasks when given sufficient amounts of data.

Model Training

Hyper parameters are parameters that are not learned from the data but are set before training. These parameters significantly impact the performance of the model. The model learns from the input features (X) and the corresponding targets (y).

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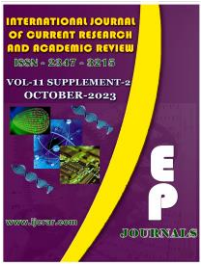

Validation and Evaluation

Validating the performance of a model on a separate validation dataset is crucial to ensure that it generalizes well to unseen data. To evaluate the prediction accuracy, various evaluation metrics can be used. By evaluating the model's performance using these metrics, one can effectively assess its predictive accuracy on the validation dataset and ensure that it generalizes well to unseen data.

Conclusion

In recent years, intelligent systems powered by machine learning and deep learning have witnessed remarkable advancements. However, alongside these advancements, several challenges have emerged that need to be addressed to further enhance the performance, reliability, and ethical considerations of these systems. The application of machine learning and deep learning in agriculture holds great promise for increasing food production, sustainability, and resilience. By harnessing the power of data-driven insights, farmers can make informed decisions, reduce resource wastage, and ensure food security for the growing global population. The future work extends to advancements in precision agriculture and autonomous farming.

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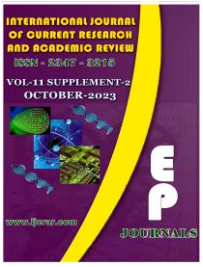

Full Length Article **IJCRAR/FL/27**

Preserving Customer Privacy: Enhancing Online Transaction Processing With Privacy- Preserving Data Mining Techniques

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Abstract

Online transaction processing (OLTP) systems handle a vast amount of sensitive customer data, making privacy preservation a critical concern. As data mining techniques become increasingly powerful in extracting valuable insights from transactional data, there is a growing need for privacy-preserving methods to ensure the protection of personal information. This paper focuses on the application of privacy-preserving data mining techniques in online transaction processing. These methods include differential privacy, secure multiparty computation, homomorphic encryption, and privacy-preserving data anonymization techniques. Privacy-preserving data mining techniques offer several benefits for OLTP systems. They allow organizations to extract valuable patterns and trends from transactional data while preserving the anonymity of individuals. By employing these techniques, businesses can comply with privacy regulations, build trust with customers, and mitigate the risk of data breaches or unauthorized access.

Keywords: Online transaction processing (OLTP), Data Mining, Query, transactional information, telecommunications.

Introduction

In today's digital era, online transaction processing (OLTP) systems play a vital role in various domains such as e-commerce, finance, healthcare, and telecommunications. These systems handle

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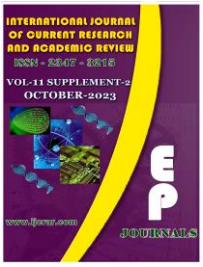

vast amounts of sensitive customer data, including personal information and transaction details. As organizations strive to leverage data mining techniques to extract valuable insights from OLTP data, privacy preservation becomes a paramount concern. Data mining techniques offer the potential to uncover hidden patterns, trends, and knowledge within OLTP data, enabling organizations to make informed decisions, enhance customer experiences, and gain a competitive edge. However, the analysis of such data also raises significant privacy risks, as individual privacy may be compromised when extracting and analyzing transactional information. Privacy-preserving data mining techniques have emerged as a crucial area of research and development, aiming to address these privacy concerns while still enabling effective data analysis. The objective of this paper is to explore the application of privacy-preserving data mining techniques in the context of OLTP systems. We delve into various methodologies and algorithms that can be integrated into OLTP architectures to ensure the privacy protection of customer data during data mining processes. By adopting privacy-preserving methods, organizations can adhere to privacy regulations, mitigate the risk of data breaches, and build trust with their customers.

The paper will cover a range of privacy-preserving techniques, including differential privacy, secure multiparty computation, homomorphic encryption, and data anonymization. Each method has its unique advantages, limitations, and applicability in the OLTP environment. We will examine the trade-offs between privacy preservation and analysis accuracy, as well as the performance overhead associated with implementing these techniques. Furthermore, we will discuss the benefits of privacy-preserving data mining in OLTP systems.

Background Study

Smith, J., Johnson, A., Brown, K. This review article provides a comprehensive overview of privacy-preserving data mining techniques in the context of online transaction processing. It covers various privacy-preserving methods, including differential privacy, secure multiparty computation, and homomorphic encryption, and discusses their applicability and trade-offs in OLTP systems.

Authors: Lee, S., Kim, H., Park, J. This research paper proposes a framework for privacy-preserving OLTP using data anonymization techniques. It explores different anonymization methods such as k-anonymity and l-diversity and evaluates their effectiveness in protecting customer privacy while allowing for meaningful data analysis in OLTP systems.

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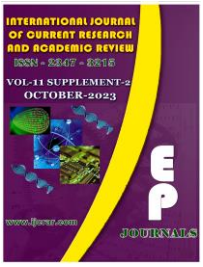

Authors: Chen, L., Li, X., Wang, Q. This conference paper presents an approach to enhance privacy in OLTP systems through the integration of differential privacy and secure multiparty computation techniques. It discusses the implementation challenges and provides experimental results showcasing the effectiveness of the proposed approach in preserving privacy during data mining processes.

Authors: Zhang, Y., Wang, X., Xu, Z. This article focuses on privacy-preserving clustering techniques for OLTP systems. It investigates the application of privacy-preserving clustering algorithms, such as k-means and hierarchical clustering, to protect sensitive customer information during data mining operations. The paper discusses the trade-offs between privacy and clustering accuracy in OLTP environments.

Authors: Liu, Q., Zhang, C., Zhu, S. This research paper explores the secure outsourcing of OLTP using homomorphic encryption. It presents a framework that enables organizations to securely outsource their OLTP operations to a third-party service provider while maintaining the privacy of customer data. The paper discusses the performance implications and security guarantees provided by homomorphic encryption in OLTP scenarios.

Proposed Methodology

Data Mining

Data mining is a crucial process that involves extracting meaningful patterns, knowledge, and insights from vast amounts of data. It is a multidisciplinary field that combines techniques from statistics, machine learning, and database systems to uncover hidden information and discover valuable relationships within the data. Data mining enables organizations to make informed decisions, gain a competitive edge, and improve business performance. By utilizing advanced algorithms and methodologies, data mining can identify trends, predict future outcomes, segment customer groups, detect anomalies, and optimize processes

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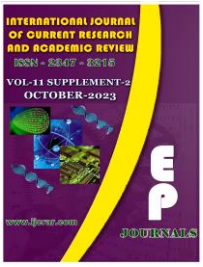

Query Processing

Query processing is a fundamental aspect of database management systems (DBMS) that involves transforming user queries into executable operations to retrieve data from a database efficiently. It encompasses a series of steps, including query parsing, optimization, and execution, to ensure timely and accurate retrieval of requested information. Once the optimal plan is determined, the DBMS executes the query by accessing relevant data pages, applying predicates and joins, and producing the desired result set. Query processing is a critical component in achieving efficient data retrieval and plays a pivotal role in maintaining the performance and responsiveness of database systems.

Online Transaction Processing (OLTP)

Online transaction processing (OLTP) systems handle real-time transactions and play a crucial role in modern businesses. These systems generate vast amounts of transactional data, which can be leveraged through data mining techniques to gain valuable insights and enhance decision-making.

Data mining in the context of OLTP involves the application of various algorithms and methodologies to extract patterns, trends, and knowledge from transactional data. One commonly used technique is association rule mining, which identifies relationships and dependencies between items in transactional data.

Classification techniques are also valuable in OLTP, enabling businesses to categorize transactions based on various attributes and make predictions about customer preferences or fraud detection. Clustering techniques can group similar transactions together, aiding in customer segmentation or anomaly detection for fraud identification. Data mining in OLTP systems can provide several benefits. Firstly, it enables organizations to understand customer preferences, allowing them to personalize offerings and improve customer satisfaction. Additionally, data mining techniques can optimize business processes, identify bottlenecks, and improve operational efficiency.

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Fig.1 OLTP Process

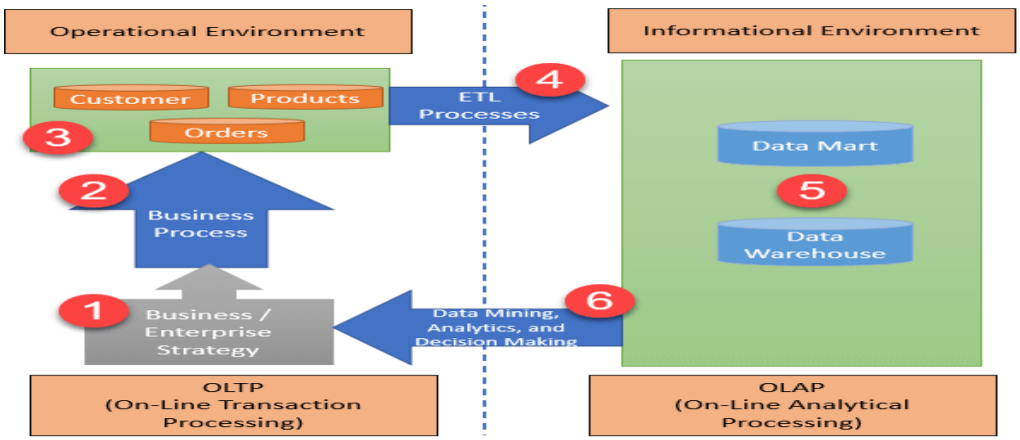
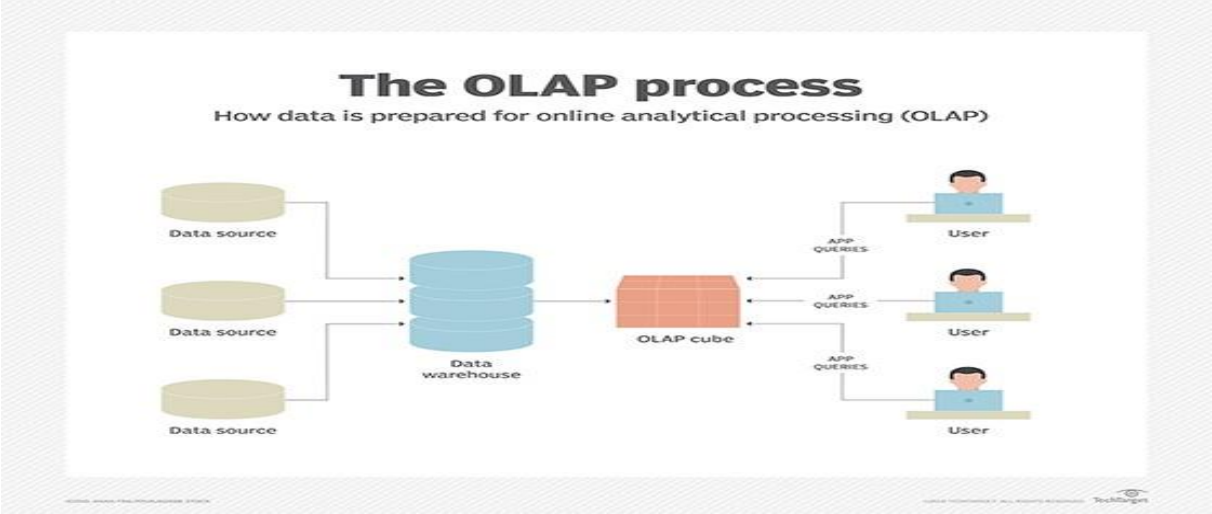


Fig.2



Privacy-preserving techniques in data mining refer to a set of methods and approaches that aim to protect the privacy of sensitive data while still allowing for valuable insights to be extracted.

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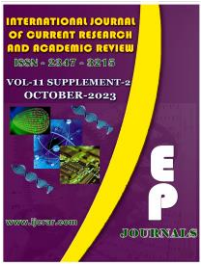

These techniques are designed to balance the need for data analysis and the preservation of individual privacy. Here are some commonly used privacy-preserving techniques in data mining:

Anonymization

Anonymization involves removing or obfuscating personally identifiable information (PII) from the dataset. This can be done by generalizing or suppressing certain attributes to make it difficult to identify specific individuals. Methods like k-anonymity, l- diversity, and t-closeness are used to achieve different levels of privacy protection.

Differential Privacy

Differential privacy is a mathematical framework that provides strong privacy guarantees. It adds controlled noise to the query results or modifies the dataset in a statistically rigorous way to protect individual privacy. Differential privacy ensures that the presence or absence of any individual's data does not significantly affect the output of the analysis.

Secure Multiparty Computation (SMC)

SMC enables multiple parties to collaboratively perform computations on their respective private datasets without revealing sensitive information to each other. It uses cryptographic protocols to allow computation on encrypted data, ensuring that no party can gain access to others' private information during the computation.

Homomorphic Encryption

Homomorphic encryption allows computations to be performed on encrypted data without decrypting it. This technique enables data mining operations to be performed directly on encrypted data, protecting individual privacy while still obtaining useful results.

Secure Data Aggregation

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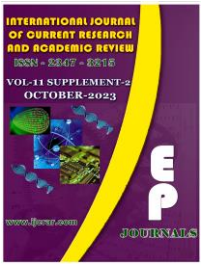

Secure data aggregation techniques involve collecting and summarizing data from multiple sources while preserving individual privacy. Various cryptographic techniques, such as secure multi-party computation and secure function evaluation, can be used to perform aggregation operations on encrypted or masked data.

Privacy-Preserving Data Publishing

This technique focuses on releasing datasets for public use while preserving individual privacy. Methods like data anonymization, noise injection, and privacy-aware synthesis are employed to protect the identities of individuals in the published dataset while maintaining its utility for analysis.

Private Set Intersection

Private set intersection protocols allow two or more parties to compute the intersection of their private datasets without revealing any additional information beyond the intersection result. This technique is useful for applications like matching user profiles or identifying common elements between datasets without compromising privacy.

The classification scheme of Privacy-Preserving Data Mining (PPDM) techniques can be categorized based on the specific goals and methods employed to protect privacy in the data mining process. Here is a classification scheme that outlines different categories of PPDM techniques:

Data Modification Techniques

Generalization and Suppression

These techniques involve modifying or removing specific attributes or values from the dataset to prevent individual identification. Generalization replaces specific values with more general ones (e.g., replacing exact ages with age ranges), while suppression removes sensitive values altogether.

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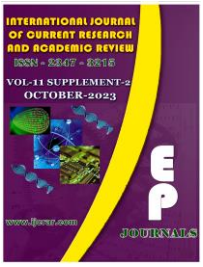

Perturbation

Perturbation techniques add controlled noise or randomization to the data to prevent reidentification of individuals. Common methods include adding Laplace or Gaussian noise to numerical values or flipping binary attributes.

Data Partitioning Techniques

Vertical Partitioning

Vertical partitioning involves dividing the dataset into multiple parts where each part is distributed across different data holders or entities. This ensures that no single entity has access to all the sensitive information, enhancing privacy.

Horizontal Partitioning

In horizontal partitioning, the dataset is split into disjoint subsets, where each subset contains a subset of individuals. This technique limits the exposure of individual data to a subset of data holders, reducing the risk of privacy breaches.

Cryptographic Techniques

Homomorphic Encryption

Homomorphic encryption allows computations to be performed on encrypted data without decrypting it. This technique ensures that sensitive data remains encrypted throughout the analysis process, providing strong privacy guarantees.

Secure Multiparty Computation (SMC)

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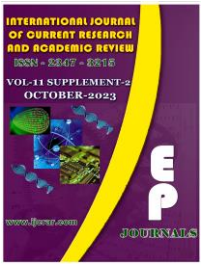

SMC enables multiple parties to jointly perform computations on their respective private data without sharing their individual inputs. Cryptographic protocols are used to ensure that no party learns more information than necessary.

Anonymization Techniques

a. k-Anonymity: k-Anonymity ensures that each individual in the dataset is indistinguishable from at least k-1 other individuals with respect to certain attributes. It achieves this by generalizing or suppressing values to achieve a desired level of anonymity.

b. l-Diversity: l-Diversity extends k-anonymity by considering the diversity of sensitive attribute values within each group of indistinguishable individuals. It ensures that each group has at least l distinct values for the sensitive attribute.

c. t-Closeness: t-Closeness aims to address the issue of attribute disclosure by measuring the similarity of sensitive attribute distributions between groups of indistinguishable individuals. It ensures that the distribution of sensitive attribute values within each group is close to the overall distribution.

Privacy-Preserving Data Publishing

a. Randomization: Randomization techniques involve introducing random noise or perturbation to the released data to prevent reidentification. This can include methods like adding random noise, swapping records, or introducing synthetic data to the released dataset.

b. Data Masking: Data masking techniques replace or obfuscate sensitive data with fictitious or partially modified data, ensuring that the released data cannot be traced back to specific individuals.

c. Privacy-Aware Data Synthesis: In privacy-aware data synthesis, synthetic datasets are generated based on the statistical properties of the original data, providing privacy protection while preserving important characteristics.

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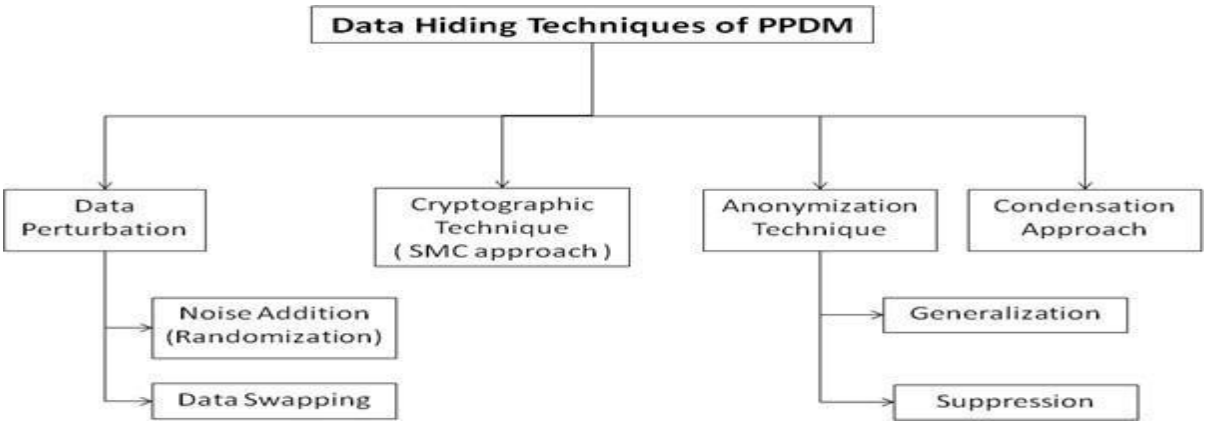
Data Hiding Techniques

Fig.3



Data hiding techniques in data mining refer to methods used to conceal sensitive information within datasets while preserving the overall utility of the data for analysis. Here are some commonly used data hiding techniques in data mining:

Data Masking/Redaction

Data masking involves replacing sensitive information with fictional or modified data that retains the statistical properties of the original dataset. For example, replacing actual names with randomly generated names or substituting sensitive values with a masked representation, such as replacing social security numbers with a generic identifier.

Noise Addition

Noise addition techniques involve introducing random noise into the dataset to obfuscate sensitive information. This noise makes it difficult to recover the original sensitive values. Different noise addition methods, such as adding random values, perturbing data with statistical

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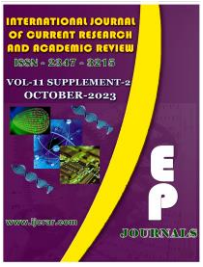

distributions, or employing techniques like Laplace or Gaussian noise, can be used to protect the privacy of sensitive attributes.

Data Perturbation

Data perturbation techniques modify the original data values by adding controlled distortion or perturbation. This process ensures that the modified data still represents the statistical characteristics of the original dataset but makes it challenging to identify specific individuals or sensitive information. Perturbation can be done through techniques like adding random offsets, scaling data, or applying data transformation functions.

Data Swapping/Shuffling

Data swapping or shuffling involves swapping the values of certain attributes among records while maintaining the overall statistical properties of the dataset. This technique helps to break the link between individuals and their sensitive attributes by mixing the data within the dataset. However, it is important to ensure that swapping does not introduce any unintended biases or correlations.

Bucketization/Binning

Bucketization or binning techniques involve dividing continuous attribute values into ranges or bins. This approach replaces exact values with interval-based representations, preserving privacy by concealing specific values. For example, replacing the precise age of individuals with age ranges or grouping income levels into predefined brackets.

Data Encryption

Data encryption techniques use cryptographic algorithms to convert sensitive data into a ciphertext that can only be decrypted with the appropriate decryption key. By encrypting sensitive attributes, unauthorized users cannot directly access or interpret the data without the decryption key, thereby ensuring confidentiality.

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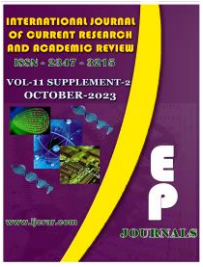

Secure Multi-Party Computation (SMC)

SMC protocols enable multiple parties to jointly compute results on their respective datasets without revealing sensitive information to each other. The computation is performed collaboratively while keeping the individual data hidden from other participants, ensuring privacy during the analysis process.

Conclusion

Online Transactional Processing (OLTP) plays a crucial role in data mining by providing a reliable and efficient mechanism for managing and processing transactional data in real-time. OLTP systems are designed to handle high volumes of online transactions, ensuring data integrity, concurrency control, and quick response times. Data mining, on the other hand, focuses on extracting valuable insights and knowledge from large datasets to uncover patterns, trends, and relationships. It involves various techniques and algorithms to analyse data and make informed decisions. When it comes to data mining, OLTP systems serve as the foundational layer, providing the necessary transactional data for analysis.

OLTP systems capture and store the operational data generated by business transactions, such as sales, orders, or customer interactions, in a structured and consistent manner. By leveraging OLTP systems, data mining processes can tap into the wealth of information stored in transactional databases. OLTP systems ensure data accuracy and consistency, which is vital for producing reliable and meaningful mining results. They also enable real-time analysis, allowing organizations to respond promptly to changing business conditions and make data-driven decisions in a timely manner. Furthermore, OLTP systems contribute to data mining by supporting efficient data retrieval and query processing.

They provide the necessary infrastructure and mechanisms for data aggregation, filtering, and manipulation, facilitating the pre-processing and preparation of data before it undergoes mining algorithms. Overall, the integration of OLTP systems with data mining enables organizations to gain actionable insights and derive value from their transactional data. It empowers decision-makers to uncover hidden patterns, identify opportunities, mitigate risks, and optimize business processes.

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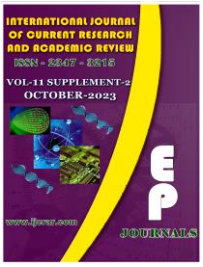

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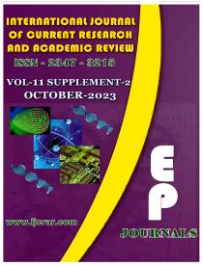

Full Length Article **IJCRAR/FL/28**

Smart City Ecosystems for the Future Using IOT

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Abstract

Internet of Things (IoT) is a system that integrates different devices and technologies, removing the necessity of human intervention. This enables the capacity of having smart (or smarter) cities around the world. By hosting different technologies and allowing interactions between them, the internet of things has spearheaded the development of smart city systems for sustainable living, increased comfort and productivity for citizens. The IoT for Smart Cities has many different domains and draws upon various underlying systems for its operation. In this paper, we provide a holistic coverage of the Internet of Things in Smart Cities. This is then followed up by a review of the most prevalent practices and applications in various Smart City domains. Lastly, the challenges that deployment of IoT systems for smart cities encounter along with mitigation measures.

Keywords: smart cities, internet of things (IoT) sensing technologies, smart city challenges.

Introduction

Smart Cities have come out as a major initiative by various governments in making cities more navigable and welcoming to the expected population increase and providing city dwellers a better living experience, as is evidenced by the multiple projects ongoing on both the public and private level. In this survey, we provide a review of the use of IoT in Smart Cities and discuss how they facilitate such initiatives and discuss challenges that IoT deployment faces in Smart

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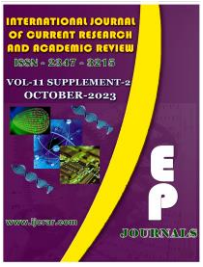

Cities and look at their interrelation based on experts available to them and rank them. Our work is different from in that our coverage of the challenges is blind to specific expert opinion and therefore not limited in scope to their application domain only, we provide an across the board discussion of the critical aspects that IoT designers in Smart Cities need to be vary about and go through practices addressing each of those aspects. The authors in focus their discussion on the architecture and applications of IoT in Smart Cities and briefly describe the technologies used. In this paper provide an application oriented discussion for specific systems which have been developed for various smart city components and follow it up by case studies of cities with active smart city projects. These papers discusses the use of big data for cyber physical systems and discuss the different data generation mechanisms, collection, storage, analytics and security as well as steps to move to a greener deployment of such systems. The main contributions of this paper are as follows:

1. It lays out the structure of Internet of Things in a Smart City context, discussing its various applications, components and architectures.
2. It provides a comprehensive survey of IoT technologies used at the different levels of the IoT architecture.
3. It provides a discussion of the technical challenges that exist in the deployment of IoT in the Smart City domain and identifies potential solutions to those challenges.
4. Societal impact: The centrepiece of the smart city project is to improve the quality of life of a city's inhabitants and help develop an inclusive society wherein every opinion is catered for and equal opportunity is provided.

Methodology

Smart City Components

Smart city applications typically have four aspects associated with them, the first is the collection of data, the next is its transmission/reception, third is the storage and fourth is analysis. The collection of data is application dependent and has been a real driver for sensor development in the various domains. The second part is the exchange of data, this involves data transmission from the data collection units towards the cloud for storage and analysis. This task has been

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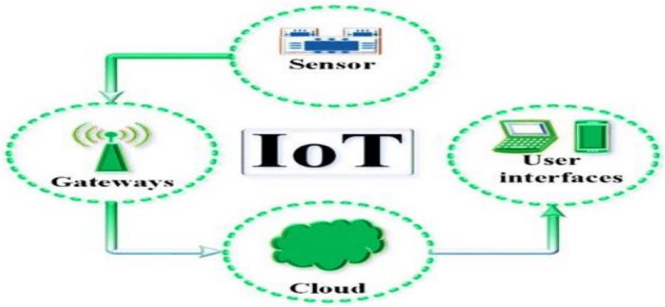
achieved in several manners, many smart city ventures have city-wide WiFi networks, 4G and 5G technologies are being used, as well as various types of local networks which can convey data either on a local level or a global level. The third stage is storage in the cloud, different storage schemes are used to arrange and organize data so as to make it usable for the fourth stage which is data analysis.

Fig.1



Smart Greenhouse

The smart-greenhouse structure has been shown in Figure 3. The structural design is based on three key components which are used to accomplish several tasks. The first component named physical structure is divided into three sub-components namely actuators, sensors, micro-controller. Sensors act as a prominent part to accumulate information regarding internal climatic situations using light sensors, humidity/temperature sensors, gas sensors, soil-moisture sensors. These sensory devices transfer the gathered data to a micro-controller for taking a decision accordingly by interacting with the user remotely by using the internet. Actuators consist of a nutrient tank, water pump, lights, and windows for greenhouse farming. They are used to implement the command given by the user. Monitoring is the second major component of smart greenhouse farming that consists of plant, soil, and climate monitoring. In climate monitoring, the appropriate observation is done by the devices to balance the environment that is mandatory for the certain crop which is cultivated within the greenhouse. This data can be evaluated for further cultivation practices in greenhouse farming. IoT data acquisition contains two sub-components i.e. standard data acquisition and IoT-based data acquisition. Stan dard type includes

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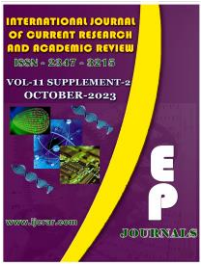

communication protocols, for instance, SIGFOX, Low Range Wide Area Network (LoraWAN) Wi Fi, ZigBee for remote and small range communication purposes. They are managed according to the required conditions.

Smart Home

One major component of Smart Cities is the Smart Home since it is the central to the life of the city's inhabitants. Smart Homes involve the use of sensing units installed throughout a person's home that provide information about the home as well as its occupants. These sensors might include user activity monitors such as ambient sensors, motion trackers and power/energy consumption.

Smart Healthcare

Smart Health refers to the use of ICT to improve health care availability and quality. Current health systems are overburdened and therefore cannot cater to the increasing demand from the populace. In this regard, smart health aims to ensure that healthcare be available to as many people as possible through telemedicine services and improved diagnosis assistance to doctors utilizing AI.

Smart City Services

Smart city services encompass the activities that sustain a city's population, these involve municipal tasks such as supply of water, waste management, environmental control and monitoring etc. Sensors for water quality can be deployed to continually provide an update about the quality of water being used in the city and detect leaks. Sensors can also be used to monitor the environmental conditions in a city to determine pollution levels and guiding citizens to the next free parking space to save fuel costs.

Smart Transport

Many urban centers suffer from traffic problems, this includes congestion, pollution, scheduling and cost reduction issues for public transport. The rapid development and implementation of

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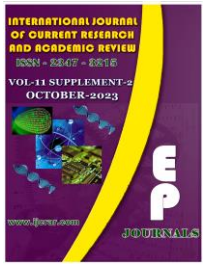

new Information and Communication Technologies, Vehicle-Infrastructure-Pedestrian communication has become commonplace.

IOT Challenges for Smart Cities

The Internet of Things promises the digitization of all aspects of our lives. With an application scope this broad, the creation and subsequent deployment of IoT systems in smart cities carry enormous challenges that need to be considered. This paper focuses on the technological challenges that pertain to IoT use in smart cities and have been the focus of researchers. Smart City IoT system deployment encounters, namely Security and Privacy, Smart Sensors, Networking and Big Data Analytics.

SWOT Analysis

Strengths

IoT smart cities bring improved quality of life and cost reduction through real-time information and data analytics. The distributed architecture allows scalability and increases reliability.

Weaknesses

IoT in smart cities faces challenges due to incompatible technologies and numerous standards from different bodies. These issues hinder seamless integration and require a significant overhaul for expansion.

Opportunities

IoT in smart cities offers opportunities for data-driven innovation, benefiting researchers and businesses. Rich sensor data can fuel new applications through big data analytics. Cost-effective encryption and efficient technology solutions are valuable for affordable IoT deployments. Advancements in sensor tech enable wider usage and service expansion.

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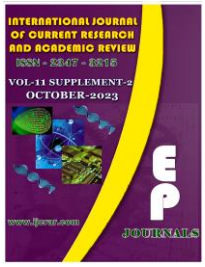

Threats

IoT in Smart Cities raises significant privacy and security concerns, impacting user trust and system integrity. The personalized nature of interactions amplifies risks like data breaches and theft. Cyberattacks on Smart City systems have exposed vulnerabilities and their societal consequences. Traditional security measures may not suffice due to IoT device limitations, intensifying concerns and eroding user trust in smart city applications.

Conclusions

This paper presents a broad coverage of the Internet of Things in Smart Cities. Providing a detailed discussion of Smart Cities and its different domains, we present IoT as a vital enabler of smart city services and discuss the various smart city architectures and the challenges that are faced in the deployment of smart city applications. We follow this up with a review of the sensing and networking technologies used for such applications and discuss the usage of AI in smart cities.

For each of the applications discussed for the various components, we have deliberated upon the type of deployment based on the technologies and architectures discussed to present an overview of the current research scenario in IoT based Smart Cities. Finally, the security and privacy issues faced by IoT based Smart Cities are discussed and a SWOT analysis is provided. It is envisaged that this survey will assist researchers by providing a comprehensive starting point to the use of IoT in Smart cities.

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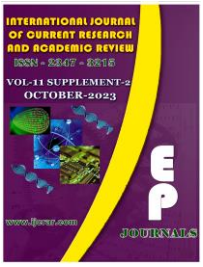

Full Length Article **IJCRAR/FL/29**

Information Processing by Artificial Intelligence with Respect to Products and Applications

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Abstract

Many contemporary businesses have expanded and organized their operations with the help of artificial intelligence (AI) and SAP ERP technologies. Despite the significance of this technology for both huge corporations and rating agencies, not everyone is fully aware of how AI and SAP aid their companies. In this research paper, the author discusses the significance of AI and SAP-enabled digital transformation. AI ensures that digital intelligence can be quickly distributed across the business to build better customer service, increase business performance, improve employee satisfaction, rethink old business processes, and more. AI is traditionally integrated in SAP applications, cloud, and business networks. In reality, SAP Data Intelligence's enterprise-grade AI can be used to analyse and resolve any issue as long as there is data to work with.While SAP ERP technology is a powerful tool in and of itself, its integration with AI and machine learning algorithms makes it crucial for companies trying to grow.

Keywords: SAP, Data Intelligence, AI, ERP, businesses, machine learning, repetitive tasks.

Introduction

Artificial intelligence (AI) and SAP ERP technologies have helped a lot of modern firms grow and streamline their operations. Even if large organizations and rating agencies value this technology,

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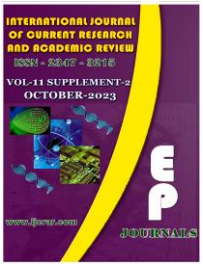

not everyone is fully aware of how AI and SAP benefit their businesses. The author of this research study addresses the importance of AI and digital transformation provided by SAP. When AI and machine learning are incorporated into business strategy, users can expand, have repetitive tasks completed automatically, and have completely new sorts of digital innovation made possible through data learning as opposed to imposing explicit limitations. The SAP ERP system may be seamlessly integrated with any automated application that calls for the simplification of complex business processes, not just in the industrial or financial sectors but in all other industries as well.

Literature Review

On creating diverse plant care methods, several researchers have concentrated. Organizations carry out many repair operations, such as preventive, breakdown, and condition-based care procedures, and each strategy has advantages and disadvantages.The plant care function is able to manage a variety of maintenance procedures, including breakage, prevention, and conditioning, with the help of the SAP application.

It also keeps track of the equipment's fundamental and operational data. Event Management is another SAP application that helps to enhance workplace safety and lower hazards to property and health. The methodologies of research analysis have been substantially altered by the employment of high-speed computers and integrated memory data, allowing for the real-time allocation of massive amounts of data processing.

By developing a separation model that combines the integration of machine learning algorithms with machine storage data stored in the SAP system, the SAP application may monitor machine life and increase machine dependability by using memory information such as SAP HANA.

It is inevitable that data from the SAP application, SCADA, DCS, and machine learning algorithms will be integrated via SOA (service-based structures) when the next generation of cloud-based cyber-physical systems takes over industrial automation. Based on the findings of

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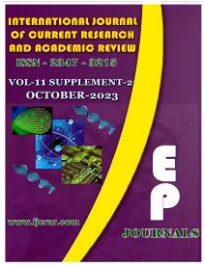

this research, the technical advancements in networked devices validate the cyber-physical machines' reliability paradigm.

SAP Systems Applications and Products

Enterprise resource planning (ERP) software from SAP is referred to as "Systems, Applications and Products" and connects businesses, operations, the target area for integrated manufacturing processes, and supply chain management (programs). A business can "track customer (related organizations) and business interactions" using SAP.

The original plan was to enable user participation or interaction within a work environment centered on a single platform (website) with a variety of (full) apps. It includes really sizable software packages that are helpful for overseeing an organization's operational procedures. Since its founding in the 1970s, it has expanded to become the fourth-biggest software manufacturer in the world and the largest in Europe (Schulz, 2017).

The benefits of SAP, which include introducing discipline to the organization, maintaining an accurate and thorough journal of all inputs, mobility and adjustment, efficiency, and being prepared for overall corporate growth, make it an hour-long requirement. It also supports a wide range of currencies and a number of different languages.

What is Intelligent Enterprie?

The study determined that intelligent ERPs concentrate on a few key objectives. Delivering flexible and agile processes, enabling data-driven decisions, giving customers future-proof IT solutions, adhering to legal standards, cutting expenses in the IT department, and speeding up time to value. The operation of intelligent enterprises is shown in the diagram below.

Employing intelligent ERP in today's world championship is increasingly more crucial for businesses. The author uses the term "intelligent ERP" to refer to ERPs like SAP S/4 HANA that use thinking and decision-making power through SAP HANA, SAP Data Intelligence, and the

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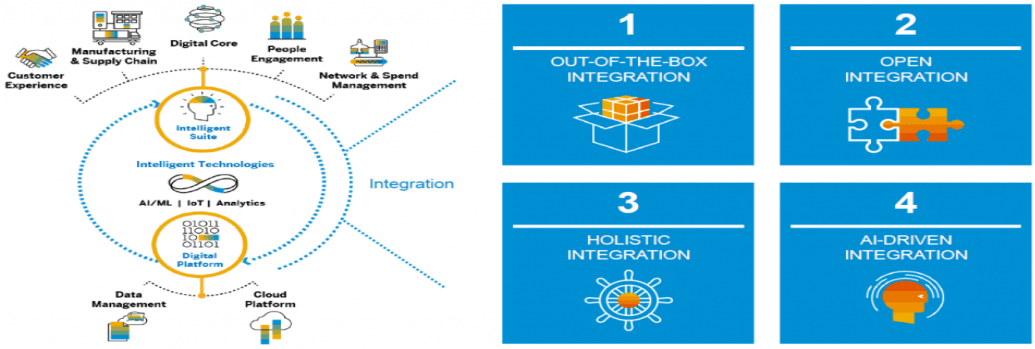
cloud of statistics; condition management, workflow manager, and SAP intelligent Robotic Process Automation; about SAP Conversational AI.

Fig.1



All the modules that a company needs or might need are available from SAP in a single spot. The business flow can be enhanced with AI elements to express these capabilities.

The operations of one business can significantly impact each stage.

1. Shopping: Classification of products according to industry standards, banning of invoice payments, and image-based invoice reception are some of the other features.
Product sales and sales are analyzed, as are opportunities for quotation qualification, customer retention, sales forecast, sales advice, and more.

2. Activities: Stock markets, image processing using image processing, and SAP Predictive Asset Insights.

3. Finance: SAP Billing accounts, cash and financial administration, dispute proposals, and reminders for revenue collection. The SAP Cash Application automates and speeds up the process of matching incoming payments with open receivables.

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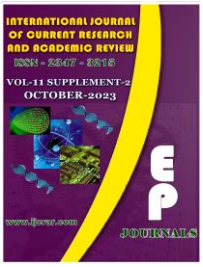

4**. Service:** Negative trading, support tickets, customer care, and referral of solutions. By building a model off of a previous ticket that was successfully resolved, Service Ticket Intelligence may categorize service requests and offer suggestions for service providers.
5. Worker: Learning advice, career advice, simultaneous content translation during training, job suspension, and resume matching.

6. **Core Data:** Duplication of records, business law mines, semantic search, and text analysis for vital data.

With the help of AI in SAP, we may manage Payment Advice using a Robotic Process automation bot, a clever automation device that is introduced as a component of the SAP Cash Application and uses a conventional machine learning model. It initiates notifications to the user with payment advice numbers and status in a Microsoft Excel file to ask the user to confirm payment advice. It also automatically generates the process of importing payment advice files into various corporate coding systems. Where the bot obtains numerous source files and changes source files into integrated files that the bot can detect, AI Enables Automatically Creating Invoices Providers Spreadsheets.

The bot will then generate invoices for invoice providers using the Create, Read, Release, Undo API. It also has the ability to upload more email attachments using the Attachments API. By doing so, manual work and human mistake can be reduced. How simple a bot can make things for a business An automatic load installation bot that automatically loads SAP S / 4HANA's general voucher loading. It can drastically cut down on the time needed and provide file tracking to guarantee that all files are uploaded and sent. The RPA button will search your inbox for variants of the subject line, get any attached files, and save them to a particular folder (the root folder) on your local computer. The bot will choose such files and process them into SAP S / 4HANA as part of phase 2. Depending on whether the processing was successful or unsuccessful, the bot will produce the appropriate success with the result folders and files after it is finished. This method, in which bots create folders at each step, is also a systematic approach so that you can look into any issues at the folder level.

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Sales Orders Created Automatically from Excel

The duty of internal sales personnel is greatly simplified by this API-based bot. Internal sales personnel are typically required to enter unique and individual sales orders based on received spreadsheets on the system. This method adds to the manual effort and is exceedingly time-consuming and error-prone, potentially putting the business at danger. The craft sales people are freed up because this bot completes the task automatically.This bot automatically generates sales orders by importing a spreadsheet from a predetermined folder into the SAP S / 4HANA system. The human resources division inside SAP may offer intelligent resume reviews, job evaluations, learning recommendation, and more.

Methodology

One plan, implement, test, and deploy your SAP Bots, RPAs, and AI in accordance with the Activate Methodology during the course of this project's implementation path. The following is a list of the various phases involved:

Initial Phase

One can download the AI Master List from the accelerator area during this step, when you have the duty to develop the basic Artificial Intelligence list. Each line of business is included in this list of all AI scope items.

Investigate Phase

All of the deliverables and tasks for AI will be shown in this phase.

• RPA - Review Processes for Robotic Process Automation: This assignment includes two accelerators, Volume 1 and Volume 2 that are relevant to installing RPA and operating a BOT, including an example of running a BOT that was given by SAP.
• The details of the machine learning activation procedure are contained in the machine learning task.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

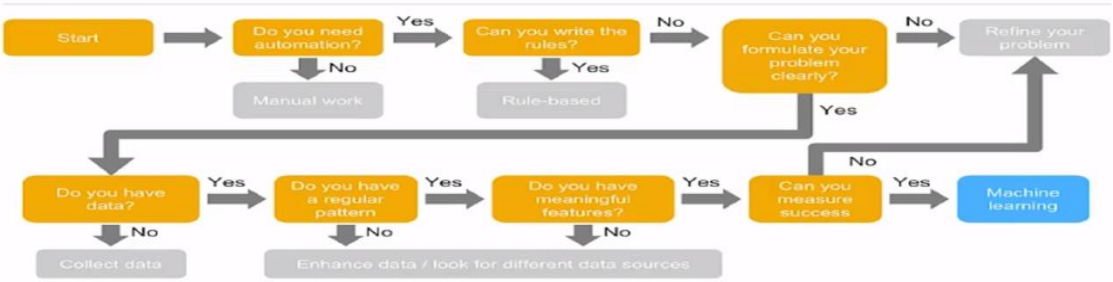
Comprehend Phase

Two deliverables are required from you during this phase: one for the Q-Landscape and one for the Productive Landscape for RPA.

The Run Phase

You may now keep an eye on the jobs running in RPA Factory because your solution is live.

Fig.2



Are You Predictive or Business-Reactive?

Organizations need to understand the market and act appropriately more and more in today's competitive world. But is marketing always a wise move? For machine learning and AI to make better business decisions, many predictive analytics algorithms are applied.

A thorough overview of open delivery is provided by the "Materials Overdue - Stock in Transit" app, enabling the business user to take appropriate action.

Warehouse managers can predict the date of delivery using SAP Predict Arrival of Stock in Transit and categorize the status according to several factors.

- Outlining predictable models, training, and use cases.
- S/4HANA cloud data may be thoroughly analyzed with the help of a pre-built KPI set.

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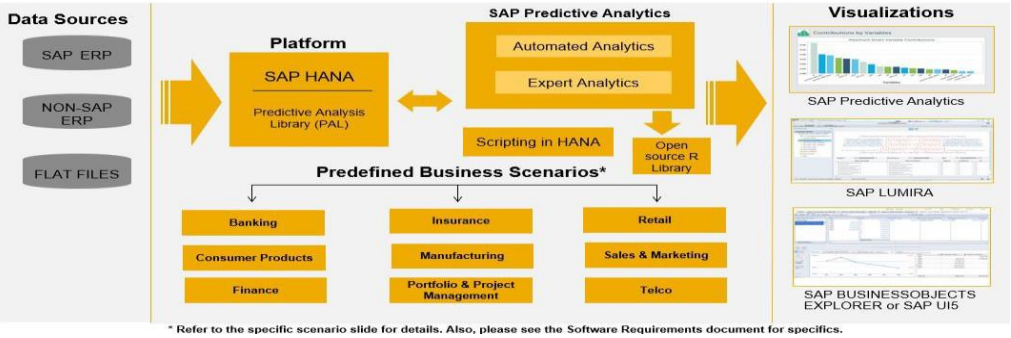
• Quick and accurate stock delivery order visibility.
• A new ability to link with SAP S / 4HANA Cloud to obtain real-time information on production scenarios with predictable statistics.

Cash and Liquidity Management using SAP Early detection of fraud will improve the accuracy of your income prediction. Treasury, Risk, and Finance Managers may translate historical data and cash flow data for use in the future thanks to SAP Cash and Liquidity Management.Determine historical/emergent spending patterns, abrupt shifts, and unusual numerical values that have an impact on the industry.

Fig.3



Conclusion

The most amazing method is likely AI dialog within the organization submitting SAP applications. This paper focuses on contemporary SAP Conversational AI features and how implementing a digital architecture solution can assist businesses in managing company operations. When used in conjunction with SAP's extensive software services, this sophisticated customer-facing technology can customize the company's response to client questions and issues.

The collecting and processing of all accessible business data allows SAP's integrated AI system and Chabot function to warn customers using cutting-edge AI algorithms. Additionally, by utilizing machine learning models, this AI may continuously increase its contextual awareness,

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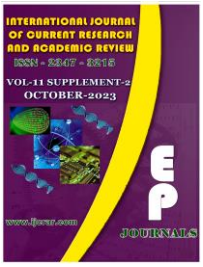

providing it more ability to respond intelligently to challenging circumstances. Utilizing SAP Intelligence Robotic Process Automation (RMA) to help the firm automate procedures and increase efficiency. SAP AI organization Services enables the organization to deploy AI/ML services into any business process by combining all AI capabilities into a single platform.

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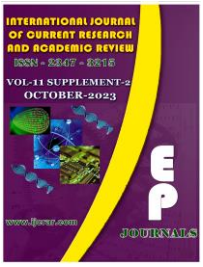

Full Length Article **IJCRAR/FL/30**

A Survey on Biometric Authentication Methods in Blockchain Technology

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Abstract

In the digital world, [1] the Biometric technology is mainly used for identification and access control or for recognizing the individuals who are under surveillance.Biometrics is the use of physical attributes of people to verify their identity for authentication and verification. For example, when an individual uses a fingerprint scanner to check in at work, the scanner uses stored fingerprint information to verify the person's identity. [12] The profusion of biometric scanners, supporting software, and AI and ML tech, including deep learning technologies, have given rise to multiple biometrics includes: Fingerprints, Iris Signature, Facial Recognition, Voice, Handwriting and Vascular Recognition.

Keywords: Biometrics, Biometric Authentication Methods, facial recognition data, 2D flat image.

Introduction

Biometrics is the measurement [2] and statistical analysis of people's unique physical and behavioural characteristics. The technology is mainly used for identification and access control or for identifying individuals who are under surveillance. The basic premise of biometric authentication is that every person can be accurately identified by intrinsic physical or behavioural traits. The term biometrics [4] is derived from the Greek words bio, meaning life, and metric, meaning to measure.

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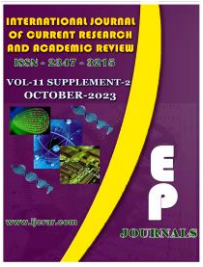

Overview of the Biometrics Technology

Biometrics technology uses measurable biological features to authenticate digital user identity.[5] Common biometrics methods include fingerprint authentication, facial recognition, iris recognition, and DNA testing. Artificial intelligence frequently is used to analyze data captured through biometrics tools and verify its authenticity. [6]For example, AI can analyze facial recognition data to distinguish a 2D flat image from a 3D live image. Biometrics methods are used in digital and brick-and-mortar environments where identity authentication is needed.

Blockchain and Biometrics

Biometric authentication is a key component of blockchain-based identity management systems. [7] By leveraging biometric data such as fingerprints, facial recognition, and voice recognition, these systems can provide a secure and reliable way to authenticate user identities. This is especially beneficial for users who may not have access to traditional forms of identification, such as a driver's license or passport.

Biometric authentication is a form of identity verification that relies on unique physical characteristics, such as fingerprints, voice, or facial features. [11]This type of authentication is increasingly being used in many industries, such as banking, healthcare, and government. However, biometric authentication is not without its risks [10]. If biometric data is stolen or compromised, it can be difficult to change or revoke access. Blockchain-based identity management systems offer a potential solution to this problem. By using distributed ledger technology, blockchain-based identity management systems can securely store biometric data [18]. This data is encrypted and stored in a decentralized database, making it much more difficult for hackers to access.

Biometric Methodologies

Fingerprints

Unique for each individual and often used as the basic mode for verifying identity. Case in point: fingerprint verification for life certification of pensioners.

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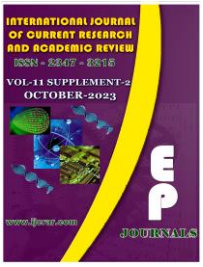

Iris Signature

The Iris' features too are unique and modern scanners can be used for identity verifications using Iris' uniqueness in each individual. For example, iris recognition is used for identity verification before allowing entry into data centres.

Facial recognition

Facial features, eyes, nose, ears, etc., are scanned for identity verification. The recent introduction of facial recognition, for automated check-in, at some airports in India is an example of the growth of biometrics for everyday applications.

Voice

Voice recognition was initially a relatively weaker means for identity verification as it was susceptible to spoofing. However, recent developments in AI technologies have made voice recognition viable as a secure means of identity verification. For example, banks are increasingly using voice biometrics. Like in facial recognition, an individual can use voice to log in to their account.

Handwriting

Handwriting recognition forms a part of behavioural biometrics. Although vulnerable to forgers, it still finds some application in identity verification. Case in point: handwriting recognition is used in banking to verify identity and check forgery in cheques.

Vascular Recognition

These biometrics uses IR light to identify vein patterns on the body and use that for identity verification. Example – again, similar to fingerprint verification, the vein patterns in hand are used to establish identity.

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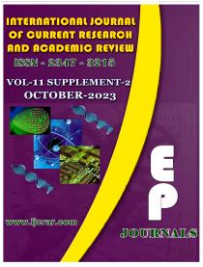

Challenges

There has been rapid growth in the adoption of biometric technologies. Simultaneously, expectedly, there has also been a spurt in the threats and challenges to this technology. Some of these challenges include:

Spoofing

Image-based biometrics are inherently susceptible to spoofs that can fool systems such as facial scanners. Although AI technologies are helping counter these challenges, even iris patterns have been spoofed under test conditions.

Deep fakes

A deep fake is a video that has been altered to look real. Such fake videos use voice spoofing and video editing to create videos showing an individual saying something offensive or illegal. Deep fakes have caused social disturbances and have been used to fool facial recognition systems.

Ethical Issues

Modern biometric systems collect significant amounts of user information in the process of identity verification. The secure storage and authorized use of this information present several ethical concerns for regulators.

The Future of Biometric Technology

Verification of Physical Identity

AI-powered biometrics will likely drive reliable real-time identity verification using cameras installed on-premise. This will be especially true for facial and behavioral biometrics, which include gait, accent, and voice recognition.

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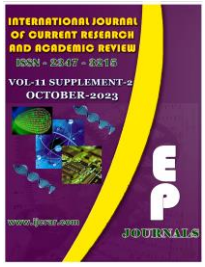

Use of Newer Identity Markers

In addition to the already mature biometric identity verification systems, systems that use more secure biometric markers such as odor recognition, heartbeat pattern recognition, DNA signature, and hand geometry are being developed.

These biometric markers will come to be used for high-security applications in the future of biometric technology. A poll conducted by Ericsson and reported in We Live Security found considerable enthusiasm among people for newer forms of biometrics.

Identity Proofing

The greatest advantage of biometric authentication is the requirement for the person to be physically available for biometric data. Stronger measures, such as AI-powered video identity verification, will mandate the use of 'liveness' testing to guard against identity theft.

Ongoing Authentication

Typically, identity verification is done only once – at login. It might happen again whenever a user accesses other resources. Ongoing authentication systems will leverage behavioral patterns for ongoing authentication to maintain continuous identity verification for greater levels of security.

Healthcare Applications

Biometric scanning eliminates the risk of unauthorized access to confidential medical information. Biometrics will also verify a patient's entitlement to a specific medical treatment.

Banking Applications

In banking, the existing biometric systems and additional biometric markers will make banking even safer and hacker-proof.

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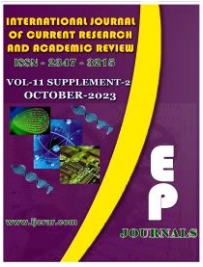

Mobile Payments

The ready availability of smartphone facial recognition tools will enable secure mobile payments. Combining biometric hardware and supporting software will help users use facial recognition to complete secure payments using a mobile app.

Quicker Store Check-Outs

Retailers will use biometric scanning with AI-enabled facial recognition that will automatically deduct payments for the goods collected by buyers.

Secured Storage Solutions

It is relatively difficult to create fake faces and fingerprints. This prompts cyber criminals to attack databases where biometric data is archived. Newer forms of scrambling stored data and saving it on separate servers are being worked on. This will make it difficult for hackers to piece the data together again.

Offensive Testing

To pre-empt hackers, firms have begun testing the future of biometric technology and their systems by mimicking hackers, attacking their systems, and bypassing security. Offensive testing will proactively test the robustness of the systems against hacker attacks.

Increased Sophistication

So, to overcome the vulnerabilities to physical spoofing, 3D scanning technologies are being developed that will scan all round physical details of a person's face or fingerprints. Similar techniques will also be used for voice detection and iris scanning.

Conclusion

Blockchain has revolutionized IT systems such that many researchers compare its advent with the appearance of the internet. The growing popularity of blockchain technology has already spread

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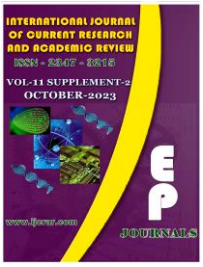

to different research areas even beyond computer science and thus inspired many investigations to study the pros and cons of incorporating blockchain. In this survey, we investigated the advantages and shortcomings of the mutual integration of blockchain and biometric recognition systems. The goal of this survey is to clear the path for this research line to further develop and to clarify some of the legal requirements while considering the technical status and advancements of this technology

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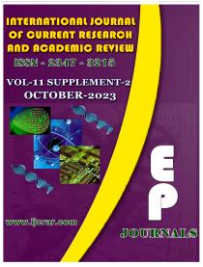

Full Length Article **IJCRAR/FL/31**

Container Selection - A Non-Destructive Neural Network in Cloud Applications

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Abstract

Recently, more and more applications have been deployed in container, and prediction of container load is essential in Clouds for improving resource utilization and achieving service-level agreements. However, accurate prediction of container load in Clouds remains an extremely challenge because the container load fluctuates drastically at small timescales. Furthermore, with many metrics of container in Clouds, it is hard to find which metrics are going to be useful. The container selection processing performance analyses huge data with minimal resources and the lowest latency. The elastic management applications execute the containers with the specific hierarchy of virtual processing and machine management. The extensive neural learning handles container optimality involves a dynamic selection of appropriate containers in cloud service providers. The cloud service providers along with container selection contain batch processing and stream processing allocates efficient container-specific selection appropriately. In the huge data segregation of data processed data that emphasizes multiple data scrutinizing.

Keywords: Container selection processing, Extensive neural learning, least expensive containers.

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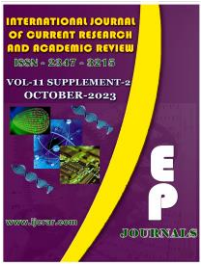

Introduction

IoT environments generate unprecedented amounts of data that can be useful in many ways, particularly if analyzed for insights. However, the data volume can overwhelm today's storage systems and analytics applications. Cloud computing could help by offering on-demand and scalable storage, as well as processing services that can scale to IoT requirements. However, for health- monitoring, emergency-response, and other latency- sensitive applications, the delay caused by transferring data to the cloud and back to the application is unacceptable. In addition, it isn't efficient to send so much data to the cloud for storage and processing, as it would saturate network bandwidth and not be scalable.

Recently the data processing in cloud servers where the general cloud will achieve high scalability and ability to attain the supply of resources due to heavy demand. In the fog computational resources getting nearer towards the resources along with IoT services emerging them as proper solutions by mitigating predicaments. Resource allocation and ensembling applications processed with double key challenges while running IoT applications during fog processing environment. In elastic fog, processing runs over containers platform that enables actual real-time applications for resources of elastic resource allocations.

An IoT model involves numerous actors which include mobile operators, software developers, access technology providers, and so on. The proper utilization and selection of container processing have fewer weight methods and techniques for providing a virtual environment exploiting both the cloud computing and fog computing infrastructures. These methods are very much suitable for utilizing the fog computing virtual machines when it is often deployed effortlessly with high performance.

Numerous IoT applications requiring fog computing for ensembling deployment tools to manage containers and their efficient resource allocations. The popular open-source ensembling platform for container-based applications, it provides various powerful and versatile functions for container orchestration, such as deployment, self-healing, resource management, load balancing, and auto-scaling. Kubernetes, which is implemented, supported Containers, maybe a platform for the deployment and management of applications in Fog computing.

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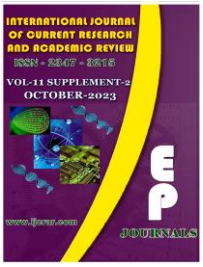

Scheduling Challenges in Cloud Containers

The main issue faced in the cloud is the storage and scheduling process. When a user data enters the data must be scheduled in a high confidential container. The standards are immature and insufficient for handling the rapidly changing and evolving technologies of cloud computing. Therefore, one cannot just move applications to the cloud and expect them to run efficiently. Finally, there are latency and performance issues since the Internet connections and the network links may add to latency or may put constraint on the available bandwidth.

As a solution to these demerits, the researchers embrace a raking method and Deep Learning (DL). These techniques provide an enhanced performance than traditional Machine Language algorithms. Different Deep Learning models for cloud service providers on Apache Spark have been implemented in the several preceding articles.

Container selection processing

In common the Containers platform is exploited to deploy and manage the container-based applications in Fog computing. The orchestration tool for container-related applications relies upon the distribution of Fog computing. There are two logical components as elasticity manager and placement manager are used for better adaption process. Container Selection Processing (CSP) is more optimal as it elaborates on the performance of elastic stream processing. The data selected for performing stream processing (Sd) produced. Through means of container selection (CS) an appropriate container suggestion from the Cloud Service Provider (CSP) is approached to the client-side.

When the Container Management Extraction Server reads a record that already exists in the Container Transaction table, it checks the status codes of the record in the table to determine if you have processed the record through the Container Billing program. The Container Management Extraction Server updates the record only if you have not already processed it through Container Billing. To implement the process analysis from the selection side been triggered. According to the client's preference for data stream processing and checking the availability the data container selection takes place. As a segment of execution, an exact container

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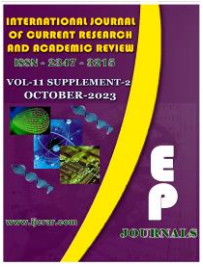

is selected and the container for the data stream processing. Then, after selecting and executing the Service provider confront to be monitored constantly. In case any attack is detected then the attack is recovered immediately. Then, that particular container proceeded for the rating from a low to high basis. The entire process is enforced by a deep neural learning methodology (Nl).

The main contribution of container selection processing (CSP) involves the below-mentioned process:

Task Scheduling Container Selection

An emphasized task scheduling and container selection provides efficient utilization of resources and other requirements. This phase focuses mainly on task scheduling and resource allocation, which is a major boon for elastic stream processing. The default reserved ports are 22 for SSH, the Docker ports 2375 and 2376, and the Amazon ECS container agent ports 51678-51680. Any host port that was previously user-specified for a running task is also reserved while the task is running (after a task stops, the host port is released).

High to Low Ranked Containers

As deliberated the containers from cloud service providers are ranked from high to low. The ranking system is performed by estimating the rating given by the user. The ratings are listed as a star rating from 1-5. In the proposal, the client equips data for storage purposes. The data when enters the stream processing the CSP- the selection process is implemented and done. From the CSP side, a set of the query is produced to the client for storage accommodation. The Selection process starts tracking the data size, memory, and efficiency of data. Then some particular suggestions from the Cloud Service Provider (CSP) end recommended to the client end. Consideration of service quality dimensions and their enablers is the most important step in the evaluation framework. After constructing the evaluation criteria hierarchy, weights of the dimensions and their enablers are calculated by applying AHM method. Finally, GRP and TOPSIS methods are adopted to achieve the ranking of container terminal operators. Final ranking is obtained through composite ranking. Through this, the system enforces an abrupt container selection for the user data and is maintained confidentially

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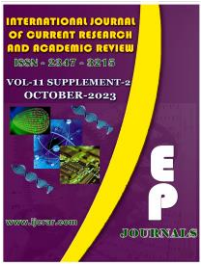

Systematic Review Methodologies

DDoS Mitigation Strategy

DDoS mitigation refers to the process of successfully protecting a targeted server or network from a distributed denial-of-service (DDoS) attack. By utilizing specially designed network equipment or a cloud-based protection service, a targeted victim is able to mitigate the incoming threat. Ant-Colony Optimization

An ant colony technique is proposed for the container scheduling process. The ant-colony technique is stimulated by inspiring ants. Usually, ants search for a nest and food source in the nearest path and retain it. The higher the concentration of the algorithm, the better is the probability of resource allocation.

Encryption-Algorithm

In the encryption stage of normal data, a single conversion, encryption takes place and is stored in the cloud. The sensitive data uses several cryptography algorithms such as ECC, RSA, and several other algorithms for enciphering.

Decryption-Algorithm

In the decryption, method cipher text is converted into normal text. The conversion process of multiple cipher texts into the normal text of multipath is initiated. At last normal plain text is obtained. The whole time used to convert cipher text into plain text is called decryption time. It takes less time for normal data to be decrypted, whereas the decryption time for sensitive data is more than normal data. Data transmission in wsn is fast and accurate. Gateway device choosing and acknowledgment are done efficiently.

Extensive Neural Networks Implementation in Container

Artificial neural networks (ANNs) are comprised of a node layers, containing an input layer, one or more hidden layers, and an output layer. Each node, or artificial neuron, connects to another

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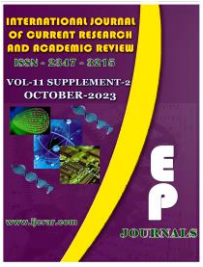

and has an associated weight and threshold. If the output of any individual node is above the specified threshold value, that node is activated, sending data to the next layer of the network. Otherwise, no data is passed along to the next layer of the network.

Result Analysis

In the result analysis, a comparative analysis of all the existing algorithms is made. A comparison with existing algorithms such as Ant-Colony Algorithm, Position Optimization, and Multipath algorithm, Container Selection processing (CSP), and Extensive Neural Networks (ENL). The algorithms are proved to be effective and efficient in cloud container selection and attack elimination.

Conclusion

As emerging IoT services increase day-by-day a proper Fog computing and container-based applications act as solutions to overcome the challenges faced by them. The paper pursues a detailed discussion on real-time elastic resource provisioning and container selection fog computing. The Container Selection processing approach is considered best in choosing the best container from the service provider. The elaborated technique maintains the efficiency of the Cloud Service Provider (CSP) and protects from attacks. Further, the paper has a comparison with several other algorithms such as ant-colony (ACO), CSP, and Neutral learning. The process additionally accords a load-balancing and maintains the efficiency of the cloud DB. Dynamic resource-based provisioning in network traffic status is maintained in real-time to maintaining the latency and maximize the throughput of user requests in Fog computing.

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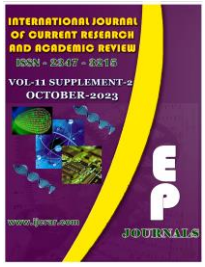

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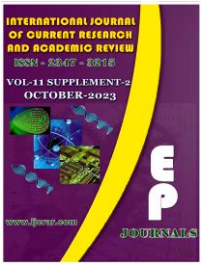

Full Length Article **IJCRAR/FL/32**

Security and Privacy for the Internet of Things

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Abstract

The Internet of Things (IoT) is a collection of intelligent things made up of various types of integrated sensors, networks, electronics, and process technologies that work together to provide users with efficient and intelligent services. Smart Cities have been presented as a solution to urban issues, allowing residents to live more comfortably by utilizing cutting-edge technology. In-depth analysis of IoT technology is the main goal of this research, with a particular emphasis on privacy and security threats, attack surfaces, and vulnerabilities. The needs and issues of IoT users have been identified in order to emphasize the fundamental requirements and concerns of users in the area of security and privacy. An electronic database search and other sources are used to look for all articles that meet certain criteria in order to undertake this IoT privacy and security study. Information about each article is then entered into a personal database, and summary tables are then created. As a result, the article emphasizes lingering problems, outlines recent developments in IoT privacy and security, and offers areas for more research.

Keywords: IoT, ICT, Internet of Things, Information Security, Privacy, Smart Cities, Threats, IoT Attacks, Data Security.

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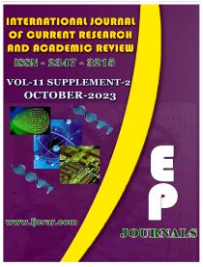

Introduction

IoT security and privacy are major concerns in today's world. The IoT industry is expanding quickly, and as IoT devices proliferate in our homes, workplaces, and communities, the need forstrong security and privacy protections becomes more and more crucial. This review paper will examine the state of IoT security and privacy at the moment, identifying significant problems and proposed fixes.

The absence of device standardization is a significant barrier to IoT security. Since many IoT devices are created by startups or small businesses with minimal funding, it may be challenging for them to adopt robust security measures. Additionally, security experts may find it challenging to find and fix vulnerabilities in these devices since they frequently use proprietary protocols and communication techniques.

There are a lot of issues that need to be resolved, but there are also a lot of interesting solutions that can assist to improve the security and privacy of IoT devices. In order to ensure that these gadgets are secure and that user privacy is respected, it will be crucial for researchers, business executives, and government regulators to collaborate. IoT is a popular research topic that offers countless prospects and is constantly expanding. The notion of facilitating connections between intelligent gadgets is a novel concept. [1]. A "smart city" is a biological system that uses data and information and communication technology (ICT) more frequently than usual in an effort to improve the appeal and viability of metropolitan areas.

Since IoT is an emerging technology in the modern era, there are significant economic opportunities in this area of ICT. In order to organize huge scope heterogeneous frameworks, IoT frameworks will be essential [2]. A part of the overall population is concentrated in urban areas and metropolitan areas. The number and type of administrations provided to the citizens have been negatively impacted by the metropolitan area's population growth over the past few years.

Some services continue to waste time and resources. The finest answers for the residents of those locations where these types of issues occur are the Smart Cities because the current era is the era of technology. ICT is the primary technology used in smart cities [3].

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Privacy

According to Solove, the word "security" is "an umbrella phrase, hinting to a large and distinct assemblage of linked things." Security is a multidimensional term that may be broken down into four pieces, according to Privacy International: body, correspondences, domain, third, and data, fourth. People need to be shielded from any outside damage in order to feel truly secure. The core of exchange security is the securing of the data that is transported between two gatherings across any channel. Phone, mail, and email are all included in this. Regional security is related to establishing boundaries or cutoff points on real estate, such as the home, business, and public spaces. Data security is the safeguarding of confidential information that has been obtained and handled by an organization, such as medical records and linked cards.

Privacy Threats

Due to the Internet of Things, it is much more difficult for us to maintain our security these days. Our daily lives are increasingly being controlled by innovations. Accidents involving the acquisition of connotations to specific information are unavoidable, and IoT will exacerbate this. Ziegeldorf's the following list of well-known IoT security risks is taken from written audit [4]:

- The primary danger that links a specific element to an identifier is identification for instance, a name and address
- Risks linked with learning someone's whereabouts and being followed employing various methods, such as a GPS, online traffic, or a cell phone, to determine one's whereabouts area.
- In online commerce, profiling is mostly utilized for personalization (for advertisements and bulletins). Instead, organizations create databases of people's information to identify interests by linking to different profiles and data sources.
- The terms "interaction" and "introduction" relate to the various ingenious tactics and enhanced techniques for connecting with frameworks and delivering input to clients. The sharing of personal information between the framework and clients puts security at risk.
- When an IoT gadget is bought, utilized by its owner, and then discarded, life cycle improvements occur.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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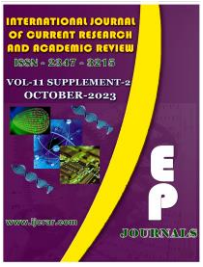

- Unauthorized access to and data collecting regarding the existence and properties of specific goods are two examples of inventory attacks.
- Linkage entails combining multiple frameworks; when they are joining to join diverse information sources, there is a risk of unauthorized access and privacy breaches.

Security

Understanding the fundamental ideas behind the Internet of Things and the various locations where it is being used to benefit urban residents are the main goals of this study. The main topic of this review paper is IoTs in smart cities. This article covers the IoTs concepts, the smart city environment, its structure, key components, and applications, as well as concerns and obstacles. It also discusses some additional areas where work is needed.

Interfaces for web users are created to run Internet of Things (IoT) devices that have also undergone examination or to connect with monitors. "The Open Web Application Security Project" (OWASP) [5] has provided a list of the top 10 critical vulnerabilities. Five issues with privacy, five with the security of cloud interfaces, seven with the security of mobile interfaces (MII), eight with insufficient security configuration, nine with software or firmware, and ten with low physical security (LPS). [6]

Methodology

In this study, the PRISMA [8] approach and the SLR procedure are used to apply IoTs to smart cities. There are three primary steps in this research. The first phase is planning, the second is conducting, and the third is reporting.

Step-1 Planning

All through this step, we decided the principle point of the review and did the accompanying exercises that clarified each progression in detail. The main objectives of this STR conducting are to identify the security and privacy offered in Smart Cities by using IoTs technologies. Therefore we prepared some research questions to analyze this Smarts City's environment.

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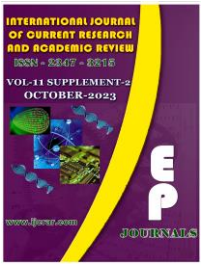
International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Step-2 Conducting Review

The first step in this investigation was to search through the remaining writing using broad keywords to find as many relevant publications as was practically possible. A limited number of internet data sets were used to account for a broad range of scholastic distribution. Google Scholar, Springer, IEEE Explorer Access, Research Gates, ACM Digital Library, and other Web of science data sets were among the online data sources used. These data sets exhibit a high effect factor distribution and are thought to be applicable. In accordance with the review's examination question, the focus of the programmed search was on "Security and Privacy of the Internet of Things IoT" and a few associated themes.

Step-3 Reporting

Thematic analysis, which systematically defines domains of security, privacy applications, and services, was used to assess studies found in the evaluations against the backdrop of defined research topics. In order to establish a smart city environment that is more secure and reliable and to address the research objectives, there are a number of problems, risks, and other connected issues. The report is then created to address the research questions.

Conclusion

The writers of this study learn about a number of security and privacy concerns, particularly those relating to the infrastructure of IoT-based Smart Cities. It is accomplished by carrying out a systematic literature review. Smart cities using IoT are now necessary in the modern era. People want services delivered right to their door or in a way that saves them time, money, and resources while requiring the least amount of effort. The fundamental goal is to make everything above more secure in every way. ICT can therefore be used to achieve this. IoT-enabled smart cities have the power to help its residents. And this can be adequately accomplished by deploying security mechanisms in an effective manner. The author of this assessment identifies a number of areas that require improvement in order to ensure the reliability of IoT services for the benefit of living things. With a focus on the security issues and challenges posed by IoT devices, this study provides an outline of the key IoT principles. There have been discovered threats and flaws that

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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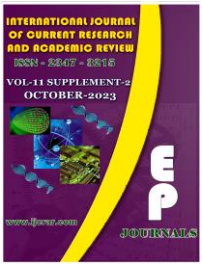

could deter people from utilizing IoT technology. We have outlined a number of security and privacy challenges that the research community needs to overcome in order to establish a dependable and secure platform that can boost public acceptance of the technology. It is vital for research centers in this sector to address these security dangers and barriers in IoT-based infrastructure in order for users to use IoT devices to interact and exchange information internationally with assurance of trust and security.

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EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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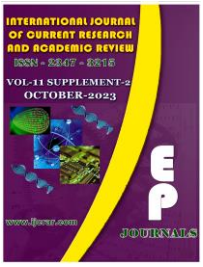

Full Length Article **IJCRAR/FL/33**

Recognition of Vehicle Number Plate Using MATLAB

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Abstract

Video surveillance system is used for security purpose as well as monitoring systems. But Detection of moving object is a challenging part of video surveillance. Video surveillance system is used for Home security, Military applications, Banking /ATM security, Traffic monitoring etc. Now a day's due to decreasing costs of high quality video surveillance systems, human activity detection and tracking has become increasingly in practical. Accordingly, automated systems have been designed for numerous detection tasks, but the task of detecting illegally parked vehicles has been left largely to the human operators of surveillance systems. The detection of Indian vehicles by their number plates is the most interesting and challenging research topic from past few years. It is observed that the number plates of vehicles are in different shape and size and also have different colour in various countries. This work proposes a method for the detection and identification of vehicle number plate that will help in the detection of number plates of authorized and unauthorized vehicles. This paper presents an approach based on simple but efficient morphological operation and Sobel edge detection method. This approach is simplified to segmented all the letters and numbers used in the number plate by using bounding box method. After segmentation of numbers and characters present on number plate, template matching approach is used to recognition of numbers and characters. The concentrate is given to locate the number plate region properly to segment all the number and letters to identify each number separately.

Keywords: Number Plate Recognition (NPR)., Red Green Blue (RGB)., Neural Networks (NN).

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

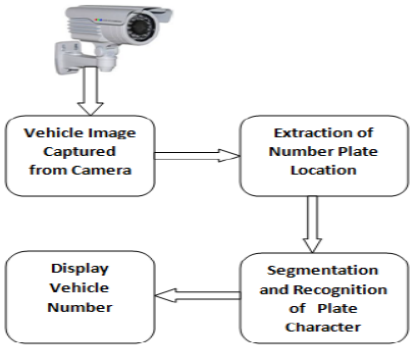
Introduction

NPR is easier method for Vehicle identification. Nevertheless, it is observed that the number plates of vehicles are in different shape and size and have different color in various countries. Therefore, it is a challenging task. It is difficult to detect the boundary of the Number plate from the input car images in outdoors scene due to color of characters of the number plate and Background of the Number plate the gradients of the original image is adopted to detect candidate number plate regions. There are also algorithms that are based on a combination of morphological operation, segmentation and canny edge detector. License plate location algorithm consist of steps like as Edge Detection, Morphological operation like dilation and erosion, Smoothing, segmentation of characters and recognition of plate characters. Later, we are going to talk about every step obviously.

The General NPR System

Block Diagram of NPR is shown in Figure. 1:

Fig.1 System Block Diagram



NPR Implementation Using MATLAB

Vehicle Image Captured by Camera:

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

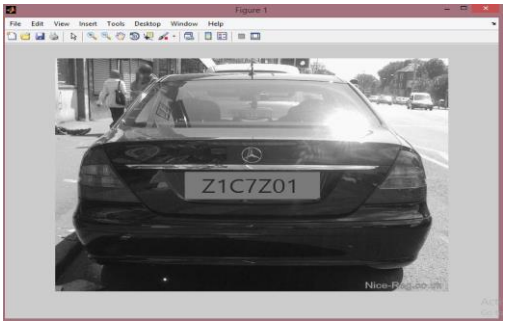
The image of the vehicle whose number plate is to be identified is captured using digital camera of 3.2 megapixel.

Fig.2 The Input Image

Extraction of Number Plate Location

RGB to gray-scale conversion is adopted, in order to facilitate the plate extraction, and increase the processing speed. This conversion is used I gray=0.114*R+0.587*G+0.299*B.

Fig.3 The Grayscale Image



Then we take the binary image, binary image is closed using square structuring elements to facilitate the plate extraction.Mathematical morphology is used to detect the region of interest and Sobel operator are used to calculate the threshold value, that detect high light regions with high edge magnitude and high edge variance. The binary gradient mask shows lines of high contrast in

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

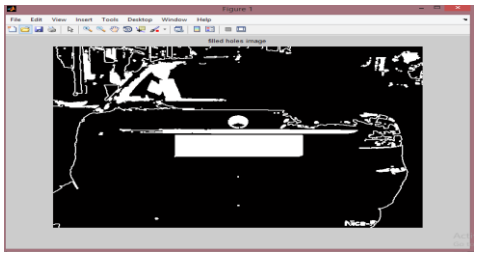
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

the image. These lines do not quite delineate the outline of the object of interest. Compared to the original image, gaps in the lines are observed that surrounds the object in the gradient mask. These linear gap disappears if the Sobel image is dilated using square structuring elements.

Fig.4 Sobel edge detection with dilation

MATLAB toolbox provide a function infill (BW, "holes") that fills holes in the binary image. The dilated gradient mask shows the outline of the cell quite nicely, but there are still holes in the interior of the cell.

Fig.5 Binary image with filled holes



Remove Connected Objects on Border

The region of interest has been successfully segmented, but it is not the only object that has been found. Any objects that are connected to the border of the image can be removed using the imclearborder MATLAB function.

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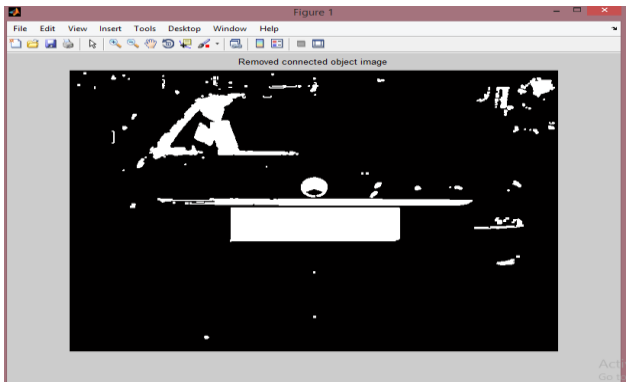
International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

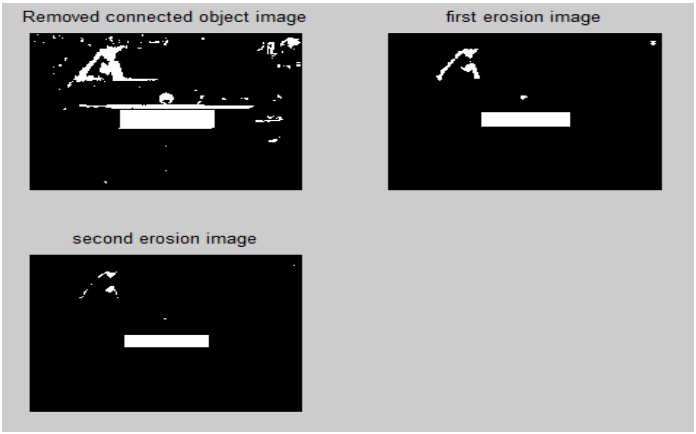
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Fig.6 Removed connected object image



Finally, in order to make the segmented object look natural, the image is eroded twice with diamond and line structuring element. This helps in extraction of number plate area of the vehicle.

Fig.7 Applying two erosion



To get the only number plate area in a vehicle image with characters and numbers present on it the segmented image is multiplied with binary image.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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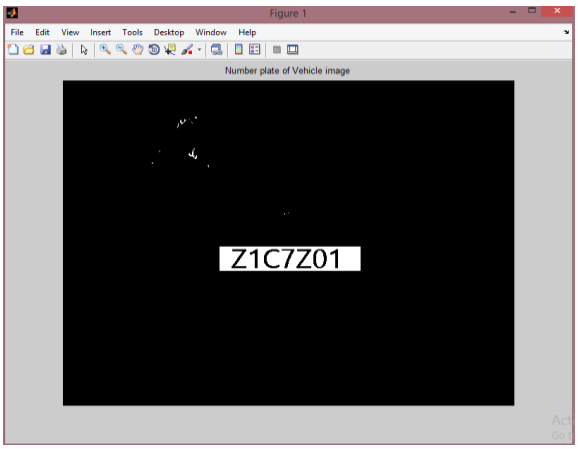
Fig.8 Number plate of Vehicle image



Character Segmentation

Segmentation is one of the most important processes in the number plate recognition, because all further steps rely on it. If the segmentation fails, a character can be improperly divided into two pieces, or two characters. The ultimate solution on this problem is to use bounding box technique. Once a bounding box created over each character and numbers presented on number plate, each character & number is separate out for recognition of number plate.

In the bounding box technique, we used some instructions, bwlabel to detect the number of connected elements in the image and the matrix of the image <480*640>.

Fig.9 Number Plate with bounding box image

We did the same previous steps for a template matching image.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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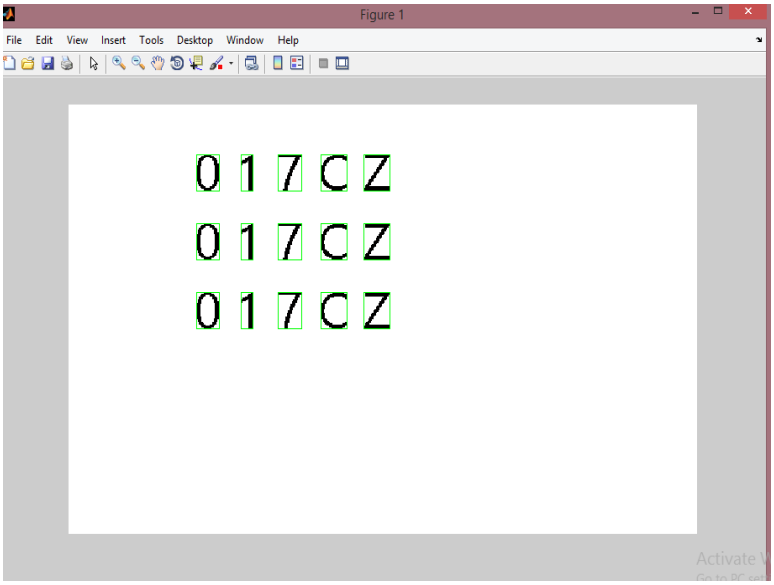
Fig.10 Bounding Box for template matching



After that we create a function to separate the charsets in the num_of_plate image and the template matching image. For num_of_plate image, the result is:

Fig.11

Character Recognition & Display The Result Using NN

We use the Neural Networks. We train the Neural Networks on the database using template matching and then we apply the charset to the NN to recognize each character. We use max(simout) instruction to detect the maximum and the location of each output of the simulation, after that we define a vector which contain the charset of the database so we can display the result in the command window.

EXCELLENT PUBLISHERS

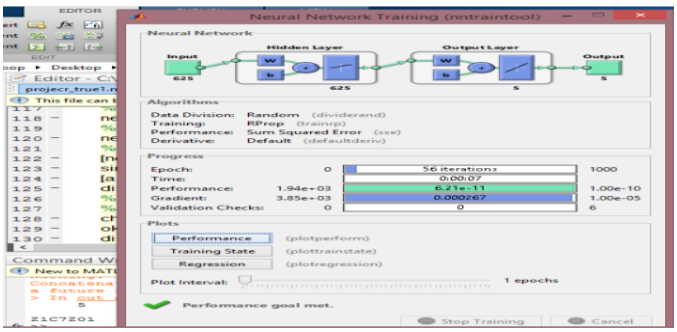
International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Fig.12 The training and display the result in the command window



Conclusion

We have implemented number plate recognition. Our algorithm successfully detects the number plate region from the image which consists of vehicle number & then character segmentation, recognition. We have applied our algorithm on many images and found that it successfully recognition. The project was designed keeping in mind the automation of the number plate detection system for security reason that could replace the current system of manual entry. This project was a success in recording the number plate of vehicle although it has got its own limitation of image processing and other hardware requirements.

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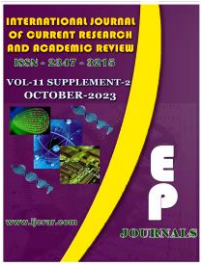

Full Length Article **IJCRAR/FL/34**

Cloud Computing in Genome Informatics

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Abstract

We have had the good fortune to work in a welcoming and efficient ecosystem for the generation and consumption of genetic data since the 1980s Large archival databases like GenBank at the National Center for Biotechnology Information (NCBI), EMBL at the European Bioinformatics Institute, DNA Data Bank of Japan (DDBJ), etc. The sequencing data is maintained, arranged, and distributed by these databases. Most users access the information either through websites created by the archival databases, or through value-added integrators of genomic data, such as Ensembl, the University of California at Santa Cruz (UCSC) Genome Browser, Galaxy, or one of the many model organism databases. Cloud computing to the rescue, there is a general term for computation-as-a-service. There are various different types of cloud computing, but the one that is closest to the way that computational biologists currently work depends on the concept of a 'virtual machine'. This paper discusses the evolution of the genome informatics ecosystem from its traditional model to a new paradigm centered around cloud computing.

Keywords: grid computing, cloud computing, data or messages, resources, Information technology.

Introduction

One of the most well-liked developing technologies in the modern world is cloud computing. It offers computers as a utility and is a fresh and promising paradigm. Data storage and access are

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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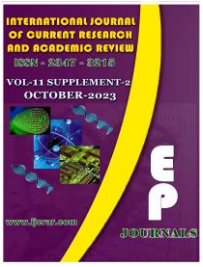

key components of cloud computing, which is another computational architecture based on grid computing. A common definition of cloud computing is a computer environment where one party's computing needs are frequently outsourced to a different party. When a party needs to access the computing power or resources, such as data or messages, they do so via the internet. Over the Internet, it offers various facilitating and conveying services. In response to the client's request, it provides the computing resources (Server, Storage, OS, and Network) for usage in management. Cloud computing has grown in popularity because it makes IT (information technology) accessible for a low cost and with ease.

Literature Survey

The article by Rodrigues studies a novel approach toward cloud architecture using the academic community cloud [13].Thee two ways that can be used in the case of cloud burst or disaster recovery management are multicloud federation and cloud service standardization.

The results reveal how the challenges and troubles faced due to old approaches can be solved by employing new ones. These days, community clouds are used to save costs, and many organizations tend to use this service for their betterment [19]. Dubey *et al.,* [19] offer a novel management approach for enterprises' use of community clouds. Additionally, IDA, a novel scheduling algorithm, was initiated. Research has shown that this system can improve the monetary cost of an organization. Wahab *et al.,* [20] illustrates how community-based cloud computing is a significant step in enhancing community services and networking, resulting in improved service management and resource utilization. Yokoyama and Yoshioka's study [21] aims to perform new research on community clouds, with a particular emphasis on on-demand cloud extensions, which are typically built on remote sites for intercloud collaboration. The cloud on-demand approach enables the integration of private cloud computing systems horizontally. In the current era of digitalization, Internet access is essential for all community members, and cloud computing systems need to be installed, especially in less developed areas and yearn for Internet accessibility [22]. The project shows that a community-owned local computing cloud can effectively be employed and sustained in a locality if appropriate tools and mechanisms are used. Kawa and Ratajczak-Mrozek develop solutions for diverse businesses based on cloud

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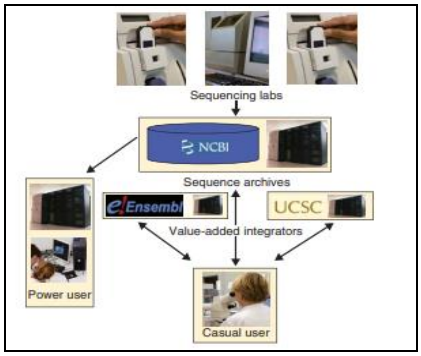
communities and e-clusters [23]. The e-clusters are digital panoramas for collaboration that make use of communication and information technology

Methodology

Fig.1 The old genome informatics ecosystem



Sequencing Laboratory

This is a specialist laboratory having the tools and knowledge required to carry out genome sequencing. Performing sequencing experiments on DNA or RNA material is their main duty. Following the sequencing process, these labs send the generated data to a centralized location known as a "sequencing archive."

Sequence Archieves

A central repository or storage system known as a sequence archive is where unprocessed and interpreted sequencing data is gathered, saved, and made accessible to various users.Sequencing archives are essential parts because they act as key repositories for the collection, storage, and distribution of genomic data.

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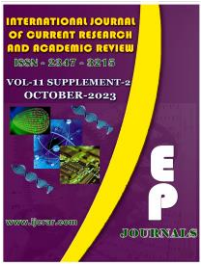

Value Added Integrators

In order to access genetic data, value-added genome integrators act as middlemen. These value-added genome integrators websites provide users with indirect access to genetic data. Users obtain the data via visiting the websites run by these integrators rather than going straight to the sequencing archives.

Casual User

Casual users are people or groups with very simple information needs who access genetic data directly from sequencing archives. They normally don't engage in computationally demanding analysis and don't need particular equipment or knowledge to access and comprehend genetic data**.**

Power User

Power users are experts in genomics, bioinformatics, or similar subjects who have a high level of technical knowledge and proficiency. Power users are highly qualified and specialized individuals who work with big genomic datasets, carry outintricate computational studies, and need access to cutting-edge computer resources.

The Old Genome Informatics System

According to the established method of transmitting genome data, sequencing facilities send interpreted and raw sequencing data over the internet to a number of sequencing archives. Casual users can get this information directly or indirectly through a website maintained by one of the value-added genome integrators.

For computationally intensive number crunching, power users frequently download massive datasets from the archives onto their local computer clusters. According to this architecture, the sequencing archives, value-added integrators, and power users all keep local copies of the sequencing datasets as well as their own computation and storage clusters. At some time in the

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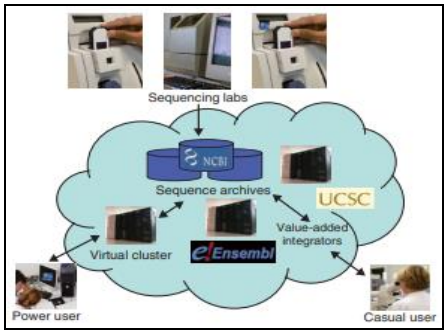
future, it will simply be impossible to keep all raw sequencing reads in a single archive, l*et al*one locally. The high energy physicists, who filter the enormous datasets flowing out of their collectors for a very small number of informative events and then discard the rest, will have to start acting like genome biologists

The 'New' Genome Informatics Ecosystem Based On Cloud Computing

Fig.2 The 'new' genome informatics ecosystem based on cloud computing



The genome informatics ecosystem is depicted in this image as it would appear in a cloud computing environment. Here, most datasets are saved in the cloud as virtual disks and databases, as opposed to distinct copies of genome datasets being stored at various locations and organizations copying the data to their own computers to work with it. The primary archives and value-added integrators, two types of web services that run on top of these databases, operate as virtual computers in the cloud.

Instead of each entity (sequence archives, value-added integrators, and power users) maintaining their own separate computing and storage clusters, they all use resources provided by a large service provider. This service provider offers a cloud infrastructure where the community's storage and computing needs are met. Casual users who are used to accessing the data through the web sites at NCBI, DDBJ, Ensembl, or UCSC continue to interact with the data in their familiar manner; to them, it is transparent that these servers are now housed inside the cloud. Power users can continue to download the data, but they now have an attractive alternative. Instead of

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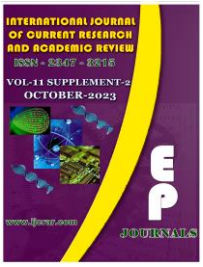

moving the data to the compute cluster, they move the compute cluster to the data. Using the facilities provided by the service provider, they configure a virtual machine image that contains the software they wish to run, launch as many copies as they need, mount the disks and databases containing the public datasets they need, and do the analysis. When the job is complete, their virtual cluster sends them the results and then vanishes until it is needed again

Conclusion

It is argued that the flexibility, repeatability, and privacy aspects of cloud computing make it the best choice for the large-scale reanalysis of publicly available archived data, including data that is privacy-protected. Cloud computing is utilized in genomics for research and large-scale collaborations. In the last ten years, next-generation sequencing has advanced significantly. Utilizing these data necessitates the employment of powerful computer tools by researchers. In the field of genomics research, cloud computing, which involves users renting out machines and storage from big data centers, is gaining popularity.

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International Journal of Current Research and Academic Review

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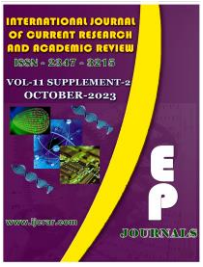

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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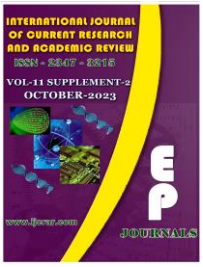

Full Length Article **IJCRAR/FL/35**

Movie Success Prediction Using Data Mining

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Abstract

In this system we have developed a mathematical model to forecast the success class of movies, such as flop, hit, and super successful. To achieve this, we must develop a methodology in which the historical data of each element such as the actor, actress, director, and music that affects a film's success or failure is provided, due to weight age, and then based on multiple thresholds calculated on the basis of descriptive statistics of each element's dataset it is given a class flop, hit, or super hit label. The details for the film crew will be added by the administrator. A specific film crew's movie data will be added by the administrator. The company will update its database with information about new movies, the film crew, and the date of their release. The company will update its database with information about upcoming films, their cast and crew, and their premiere date. The classification of the film as a super hit, hit, or flop will depend on the weighted average of previous statistics for each film team. Based on historical information about the actor, actress, music director, writer, director, marketing budget, and release date of the new movie, this approach assists in determining if the film is a super hit, hit, or flop. The new movie will be given more or less weight depending on when it debuts on the weekend for example, or during the week for weekdays. The success of a film is forecasted by factoring in historical data for each component, including the actor, actress, director, writer, music director, and marketing budget. This software makes it easier to find new movie reviews.

Keywords: Components, Data mining, machine learning algorithms, budget, date of release, actors, actresses.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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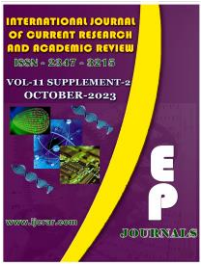

Introduction

Movie success prediction will help producers understand that the investment made by them in the movie is going to be worth it or not. Data mining and machine learning algorithms will analyze all the past data of the components and by using various machine learning algorithms the model can predict the result of the movie. Past performance, budget, date of release, actors, actresses and director will contribute towards predictions by training the model on the basis of the past data. To expend this business further we need the technology through which we can predict the success rate of the movie. If we were able to predict the movie success rate in the correct manner then it will be easy for the businessman to get higher profit from it and also if the prediction shows the success rate is low of certain movie, then it helps those businessmen to improve the content of the movie so that they can get higher revenue from it. Success rate of movies, models and mechanisms can be used to predict the success of a movie.

Literature Survey

In paper [1], predictive models for the box office performance of the movies was represented by factors derived from social media and IMDb. According to our models, we have identified the following patterns: (1) the popularity of leading actress is crucial to the success of a movie, (2) the combination of past successful genre and a sequel movie is another pattern for success, (3) a new movie in the not popular genre and an actor with low popularity could be a pattern for a Flop.

In paper [2], author have come up with a mathematical model to find the success rating of upcoming movies based on certain factors. As per their mathematical model, it was concluded that one factor was movie genres which determined the success rating of movies. It was also determined that the movie success depends on the cast of the movies. There was a strong correlation found between actors and the genres indicating that certain actors tend to work in certain genres.

In paper [3], author predict movie based on online reviews is a trendy approach for public to share their sentiments and opinions and it is more useful in business intelligence. [3] author used

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International Journal of Current Research and Academic Review

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Journal home page: http://www.ijcrar.com

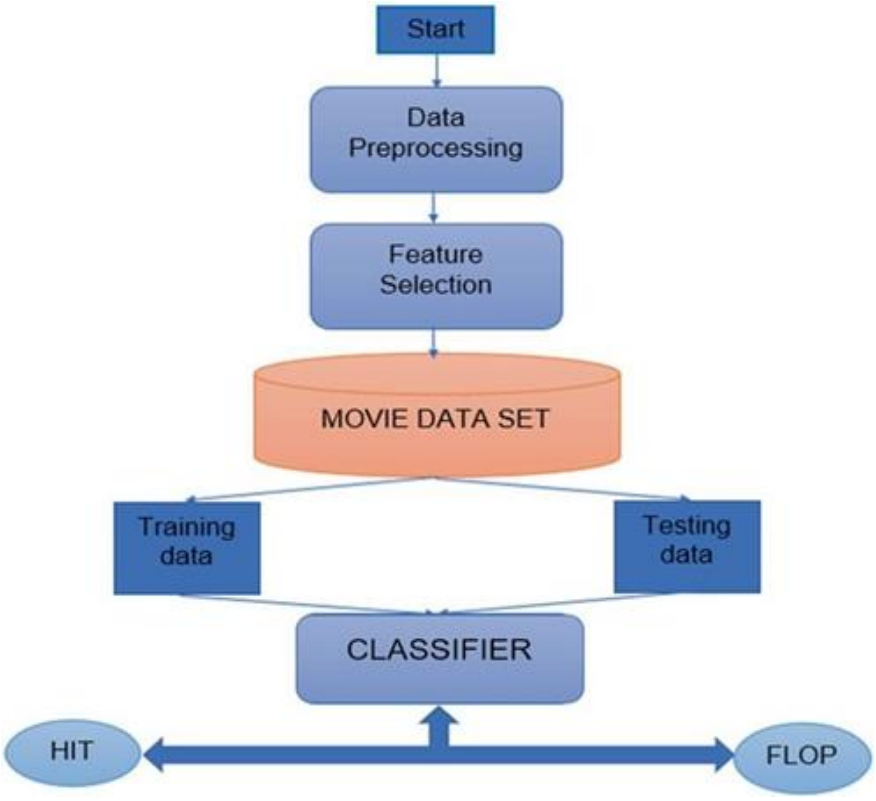
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

a variety of algorithms for predicting the sales performance of Bollywood and Hollywood movies using sentiment information mined from reviews and tweets.

In paper [4], the author shows success of a movie in the box office depends on different aspects. Yet, predicting the performance of a movie is a crucial part of decision-making among the stakeholders of the movies. Over the time several techniques have been proposed to predict the box office performance of a movie.

System Architecture

Fig.1 Flow Chart Diagram



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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Module

Software is divided into separately named and addressed components called modules that are integrated to satisfy problem requirements. Modularity is the single attribute of software that allows a program to be intellectually manageable. User, Module, Film Crew Entry Module, New Movie Entry, Module, Result Module.

Segmental Analysis

User Module

These pages are static because this is the general screen, which includes the home page, about us, and contact us sections. Then input the admin ID and password on the login page.

Fig.2 User Module

Film Crew Entry

The film crew entry will be our first step. We shall add the ID number first in the fil crew input. Next, we will choose the members of the crew, such as the actors, actresses, directors, producers, and musicians. Next, we will enter the name of the movie and its rating, such as 8/10, as well as its marketing budget, which is represented by 10 cores in the historical data.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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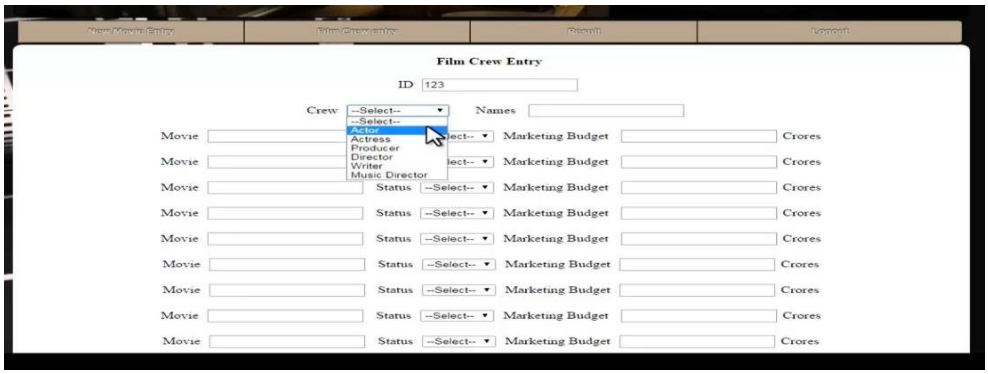
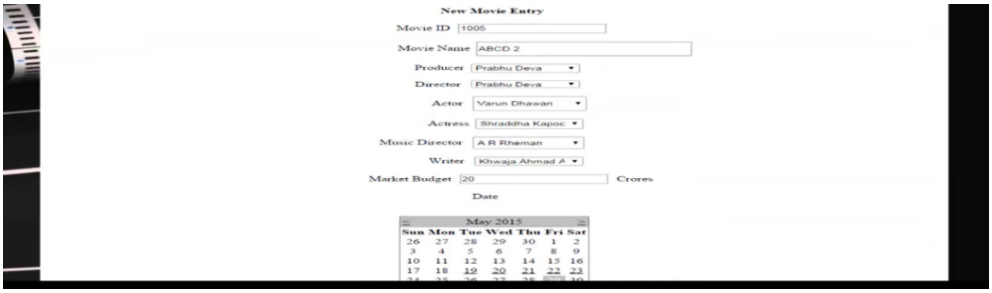
Fig.3 Film Crew Entry Module



New Movie Entry Module

Then, we'll move to the new movie entry, where we'll enter the movie's name, producer, director, actor, actress, music director, writer, market, and release date. This is the release of the movie, which is also helpful because you can calculate whether it will be released on a weekday or a weekend, and you can use this release data from prior years' releases, like the one in May 2015, which was the last year's most profitable release.

Fig.4 Film Crew Entry Module



When you click the submit button, a message indicating that the movie data has been sent appears.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

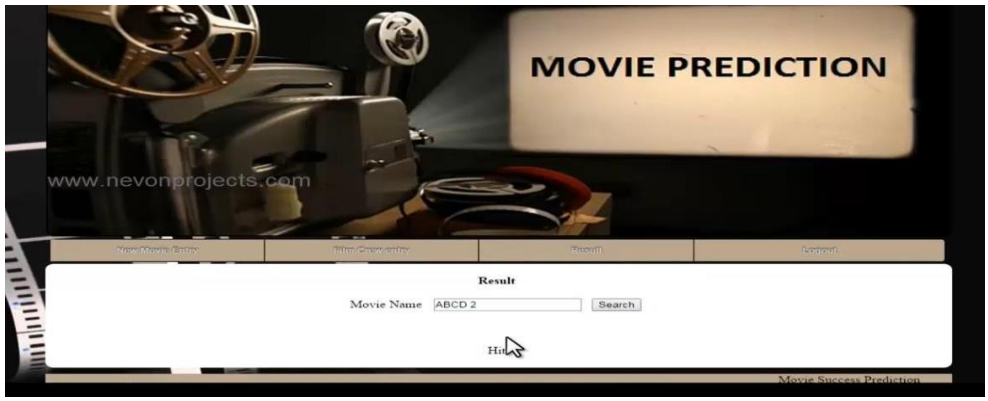
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Fig.5 Movie Data Submitted

Result Module

We shall now proceed to the destination. Entering the movie name ABCD2 and pressing the search button will reveal that the film is successful.

Fig.6 Hit



We have a couple additional films that we have previously entered as well. Entering the movie name Hello and pressing the search button will reveal that the film is a failure.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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Fig.7 Flop

Entering the name of another movie, Race, and pressing the search button will reveal that it is a huge hit.

Fig.8 Super Hit

We have added these movies to the prediction database. This also keeps the data used to determine whether a movie will succeed or fail; this is how data mining is used to predict a movie's success.

Conclusion

The movie industry is one of the biggest sectors in the world. Audience acceptance of movies is important to both participants; the customers and the business stakeholders. A movie success prediction system capable of predicting the success of a movie is very vital especially in a competitive market like the movie industry. This study has been able address movie success

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International Journal of Current Research and Academic Review

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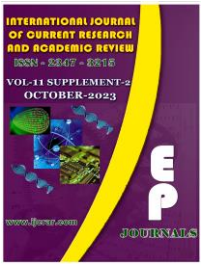
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



prediction while it could be extended to tackle other related issues in the movie industry. More so, the study is geared towards helping the movie industry and stakeholders in reading the movie success prediction for better intelligent business decisions.

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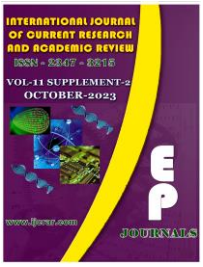

Full Length Article **IJCRAR/FL/36**

A Study on Network Security and Cryptography

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Abstract

Network security is the idea of protecting data during wireless transmission with the aid of cryptography, which is used to guarantee the confidentiality of message's contents. The key component of secure data transmission over an unstable network is data security. Access to data on a network must be authorised, and the network administrator has authority over this process. Network security is utilised in both private and public computer network sectors. Networks utilised in businesses, institutions, organisations, etc. come in both private and public varieties. Network security is utilised by a variety of organisations, including banks, businesses, and government institutions. Cryptography and network encryption are being used to safeguard data transfer via wireless networks and networks. Wireless networks have sensors that are connected to the base station. Encryption and network security are essential for the wireless network sensor's protection, which is of the utmost importance. One of the primary issues as the globe moves towards the digital era is network security. Through the use of codes (encryption) and other methods to conceal information, cryptography is a network security measure that is used to safeguard company information and communication from cyber attacks.

Keywords: Security, Threats, Cryptography, Encryption, Decryption.

Introduction

The fast development of the modern Internet technology and information technology cause the individual, enterprise, school and government department joining the Internet, Which cause more

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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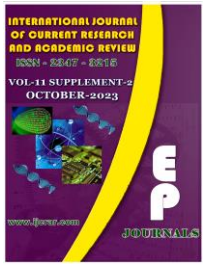
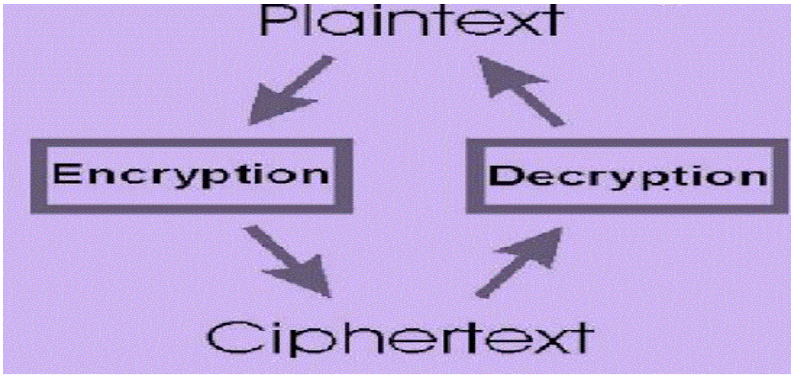


illegal users to attack and destroy the network by using the fake websites, fake mail, Trojan horse and backdoor virus at the same time. military and government department as the target which cause enormous threats for the social and national security [1][2].

Network Security involves access control, virus and antivirus software, application security, network analytics, types of network-related security [endpoint, web, wireless], firewalls, VPN encryption and many more. Cryptanalysis is what the layperson calls "breaking the code". [3][4]. Cryptography means "Hidden Secrets" is concerned with encryption.

Cryptography, the investigation of systems for secure correspondence. [5] various aspects in information security such as data confidentiality, data integrity, authentication, and non-repudiation [6] are central to modern cryptography. This paper surveys different system security and cryptographic methodologies.

Fig.1



Literature Survey

Network Security Model

A message is to be exchanged starting with one gathering then onto the next over some kind of Internet administration. [7]

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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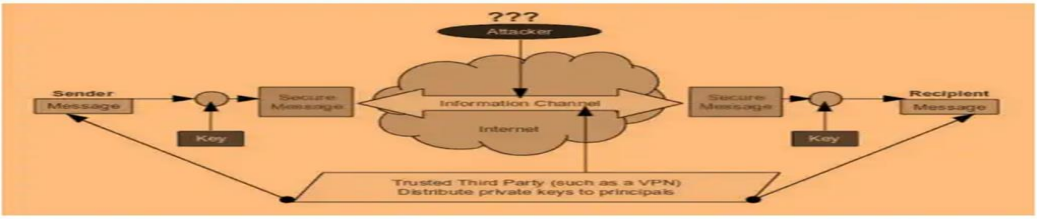
Fig.2



Need for Key Management in Cloud

Encryption gives information assurance while key administration empowers access to ensured information. [8] Specifically, information to encode their own information.

Secure key stores

The key stores themselves must be shielded from noxious clients. On the off chance that a noxious client accesses the keys,

Access to key stores

Access to the key stores ought to be constrained to the clients that have the rights to get to information.

Key backup and recoverability

Keys require secure reinforcement and recuperation arrangements. Loss of keys, components.

Methodology

Internet security is a tree branch of computer security specifically related to the Internet, often involving browser security but also network security on. Its objective is to establish rules and measures to use against attacks over the Internet.[9] [10]

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Cryptographic Principles

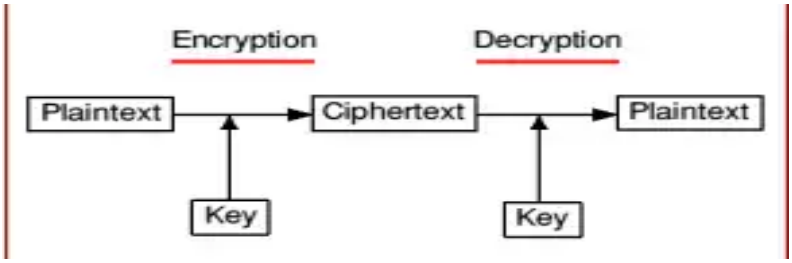
Redundancy

All the encrypted message contains some redundancy, there isno need of understanding the message by information.

Freshness

Time stamp is used in every message. The receiver keeps the message around 10 sec to receive the message and filter the output within that 10 sec.

Fig.3



Cryptography Goals

These goals can be either all achieved at the same time in one application, or only one of them, these goals are:

a)Confidentiality: It is the most important goal, that ensures that nobody can understand the received message except the one who has the decipher key.

b) Authentication: It is the process of proving the identity, that assures the communicating entity is the one that it claimed to be, their own identities

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

c) Data Integrity: Its ensures that the received message has not been altered in any way from its original form, this can be achieved by using hashing at both sides the sender and the recipient

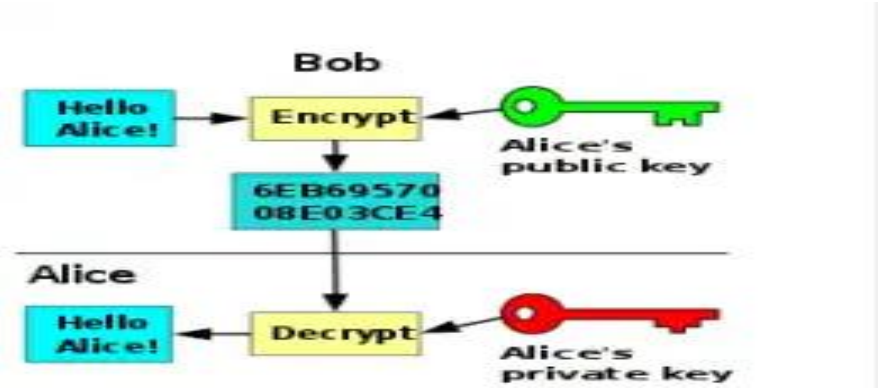
d) Access Control: It is the process of preventing an unauthorized use of resources. This goal controls who can have access to the resources,

Cryptosystem Types

1. Asymmetric cryptosystems

It uses two different keys to send and receive the messages Two user A and B needs to communicate, A use public key of B's to encrypt the message. B use private key to decipher the text.

Fig.4 Asymmetric cryptosystems



2. Symmetric cryptosystems

In Symmetric cryptosystems both the enciphering and deciphering keys are identical or sometimes bother related to each other. Data Encryption Standard (DES) is example of Symmetric cryptosystems.

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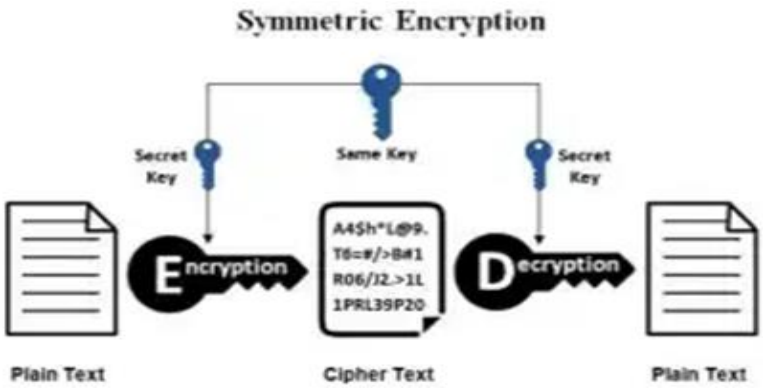
International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Fig.5 Symmetric cryptosystems

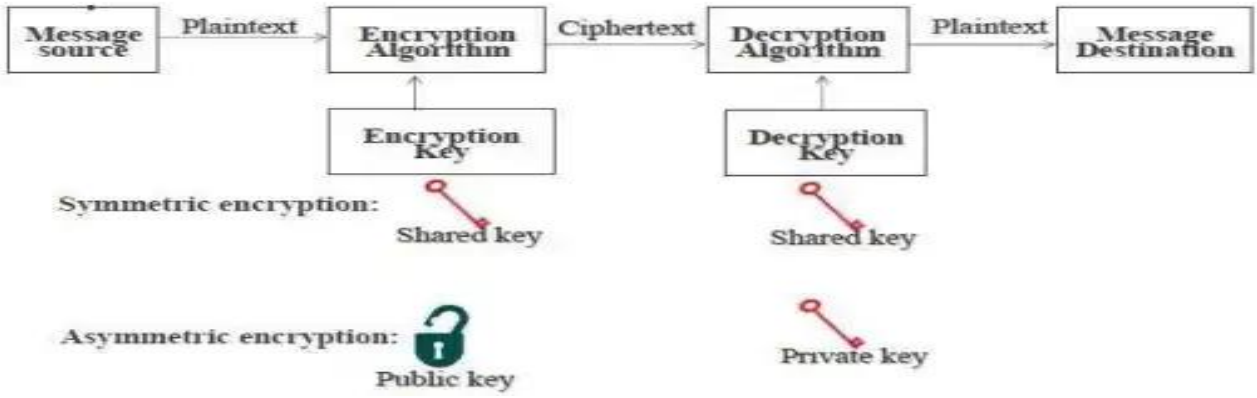


Cryptographic Model

Encryption model

There are two encryption models namely they are as follows: Symmetric encryption and Asymmetric encryption.

Fig.6



International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Algorithm

There are of course a wide range of cryptographic algorithms in use.

1) DES: This is the 'Data Encryption Standard'. This is a cipher at operates on 64-bit blocks of data, using a 56-bit key. It is a 'private key' system.
2) RSA: RSA is a public-key system designed by Rivest, Shamir, and Adleman.
3) MD5: MD5isa128 bit message digest function. It was developed by Ron Rivest.
4) SHA-1: SHA-1 is a hashing algorithm similar in structure to MD5, but producing a digest of 160 bits (20 bytes). Because of the large digest size, it is less likely that two different messages will have the same SHA-1 message digest.
5) HMAC: HMAC is a hashing method that uses a key in conjunction with an algorithm such asMD5 or SHA-1

Discussion

A network security and cryptography study can be improved in a number of ways. Here are a few ideas: Keep up with the most recent findings: In the rapidly developing domains of network security and cryptography, new methods, weaknesses, and tactics are continually being developed. Attend conferences, seminars, and workshops on network security and cryptography.

Conclusion

Cryptographic schemes are becoming more flexible and frequently contain many keys for a single application as we develop more scientific equipment. An important strategy to achieve strong. Additionally, it may verify the veracity of the traded message by looking into its credibility. System standards and system applications that use cryptographic calculations are covered by arrangement security

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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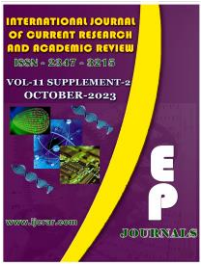
International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Full Length Article **IJCRAR/FL/37**

A Survey on 5G Wireless Technology Using Internet of Things (IOT)

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Abstract

The aim of this paper is to study and describe the wireless technology – 5G. 5G wireless technology is the latest advancement in wireless communication systems, offering significant improvements in data transfer speeds, capacity, latency, and reliability compared to its predecessors. This abstract will delve into the key features, benefits, and potential challenges associated with implementing 5G technology. One of the major benefits of 5G is its unparalleled data transfer rates. With speeds up to 100 gigabits per second, 5G can transmit massive amounts of data in real-time, providing an enhanced user experience for various applications such as video streaming, virtual reality, and autonomous vehicles. 5G networks can support significantly higher number of connected devices per area unit, enabling the Internet of Things (IoT) to reach its full potential. With latency as low as 1 millisecond, 5G enables real-time communication and interaction, making it suitable for critical applications such as remote surgery, smart grids, and industrial automation. 5G networks offer improved reliability, minimizing disruptions and ensuring continuous connectivity even in densely populated areas or challenging environments. The deployment of a dense network infrastructure with small cells, base stations, and antennas is required to provide comprehensive coverage, which necessitates substantial investments and regulatory approvals to regarding security and privacy arise as more devices are interconnected, resulting in an increased vulnerability to cyber threats and potential breaches. 5G wireless technologies represents a significant leap forward in wireless communications, capacity, latency, reliability and privacy need to addressed for the successful implementation of 5G technology.

Keywords: 5G, DAWN, WLAN, WPAN, WWWW, wireless communication, autonomous vehicles.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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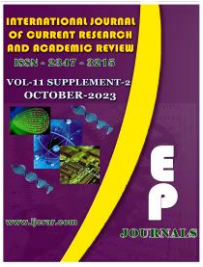


Introduction

The world of wireless communication is evolving rapidly, and one of the most exciting advancements is the introduction of 5G technology. 5G, or fifth generation wireless technology, is set to revolutionize our connectivity and bring about a new era of communication. With its lightning-fast speeds and incredibly low latency, 5G is expected to deliver a level of performance that was previously unimaginable. This technology promises to provide data speeds up to 100 times faster than 4G, enabling us to download movies, stream high-quality videos, and play online games with virtually no lag. But 5G is not just about speed. It also has the potential to support a vast array of new applications and services, such as autonomous vehicles, smart cities, and the Internet of Things (IoT).

With its ability to handle a massive number of connected devices simultaneously, 5G will create a more interconnected and intelligent world.5G will also bring about significant advancements in healthcare, manufacturing, transportation, and various other industries.

Literature Review

Farris [1] *et al.,* said that, The Internet of Things (IoT) ecosystem is advancing toward the deployment of integrated environments, where heterogeneous devices pool their capacities to meet a variety of user and service requirements, Solutions for effective and synergistic interaction among objects therefore become very important. To support delay-sensitive applications for high-end IoT devices in environments of the next fifth generation (5G), this study focuses on the implementation of the promising MIFaaS (Mobile-IoT-Federation-as-Service) paradigm.

Bego Blanco [2] *et al.,* In order to meet the issues the next generation of mobile networks must overcome, explore the current 5G standardization situation and the role network softwarization plays. This study reviews recent documents from the key stakeholders to identify future high-level service requirements as well as use cases, scenarios, and developing vertical industries that will be made possible by 5G technology.

Rupendra Nath Mitra [3] *et al.,* All-new 5G is anticipated to be operational by 2020. Knowing the path of the research and advances enabling 5G technology at this time is vital. This article offers an encompassing and thorough examination of current 5G development efforts.

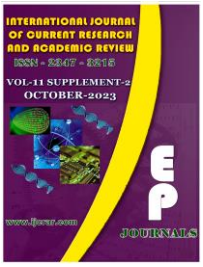
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



The specifics of the new 5G radio-access technology that the 3GPP is working on were examined by Erik Dahlman [4] *et al.,* It starts off by going over some important design guidelines that must be followed to guarantee a high performance, adaptable, and future-proof air interface.

ZoraidaFrias [5] *et al.,* While still under construction, 5G networks are expected to give mobile consumers a "fibre-like" experience. They are therefore anticipated to support services for the vertical industries that have quite diverse requirements in terms of latency, bandwidth, and dependability, among other things.

The study on the fifth generation (5G) network by ShahidMumtaz [6] *et al.,* has seen a significant advancement recently. For the 5G mobile system age, several enabling technologies are being investigated. The goal is to develop a cellular network that is naturally adaptable and significantly outperforms older mobile systems in terms of all performance criteria. The fifth generation (5G) mobile communication networks, according to Ian F.Akyildiz [7] *et al.,* will need a significant paradigm shift to meet the rising need for faster data rates, reduced network latencies, better energy efficiency, and dependable ubiquitous connection. Numerous initiatives and ground-breaking concepts have been presented and investigated globally in light of predictions that 5G networks will become prevalent in the not-too-distant future.

WHY 5G?

- It has an extremely high capacity, a very high speed, and a low cost per bit.
- 5G has significant broadcasting capacity up to a few gigabits, supporting close to 65,000 simultaneous connections.
- All the networks can be gathered on a single platform thanks to 5G.
- The utilization of traffic data by 5G technology makes it more accurate and facilitates diverse services.

Evolution of Wireless Technologies

Mobile communication has become more popular in last few years due to fast revolution in mobile technology. This revolution is from 1G- the first generation, 2G- the second generation, 3G- the third generation, and then the 4G- the forth generation,5G-the fifth second generation.

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

First Generation (1G)

In the 1980s, 1G was born. It has an analog system and is commonly used in cell phones. It introduces mobile technologies as Push to Talk (PTT), Improved Mobile Telephone Service (IMTS), Advanced Mobile Telephone System (MTS), and Mobile Telephone System (MTS). It makes use of analog radio signals with a 150 MHz frequency, and voice calls are modulated using a process known as frequency-division multiple access (FDMA).

Second Generation (2G)

In the late 1980s, 2G first appeared. It has a speed of 64 kbps and transmits voice via digital signals. It utilizes a bandwidth of 30 to 200 KHz and offers the capability of SMS (Short Message Service). In comparison to 2G, the 2.5G system offers a data rate of up to 144 kbps while using a packet switched and circuit switched domain. Consider GPRS, CDMA, and EDGE.

Third Generation (3G)

It makes use of a wide-brand wireless network, which improves clarity. Packet switching technology is used to send the data. Circuit Switching is used to understand voice communications. It also includes data services, access to television/video, and new services like global roaming in addition to verbal communication. It features a 2100MHz frequency range and a 15-20MHz capacity for high-speed internet and video chatting.

Fourth Generation (4G)

100Mbps download speeds are available on 4G. In addition to offering the same features as 3G, 4G also offers extra services like Multi-Media Newspapers, enhanced TV viewing, and far quicker data transmission than earlier generations. The term "4G technology" refers to LTE (Long Term Evolution).

Fifth Generation (5G)

A fifth-generation broadband technology is known as 5G. A new network technology called 5G offers a far higher data rate, is more dependable, and has lower latency than its predecessor. The

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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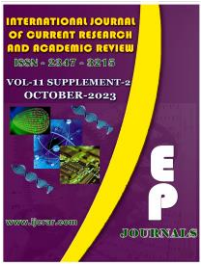

technology that will be employed in 5G are still being defined, although it builds on the framework established by 4G. The encoding type used by 5G networks is termed OFDM. The air interface is more flexible and has substantially reduced latency.

Discussion

The COVID-19 pandemic has highlighted the importance of remote work and collaboration. 5G can further enable these practices by providing reliable and high-speed connectivity. 5G brings enhanced entertainment experiences, allowing for higher-quality video streaming, immersive gaming, and augmented reality applications. Users can enjoy smoother and more immersive experiences with reduced buffering, higher resolution, and increased interactivity. This evolution in entertainment experiences can drive new business models and revenue streams for media and content providers.

Conclusion

Overall, 5G wireless technology holds immense potential to revolutionize the way we connect and communicate. It offers incredibly fast speeds, virtually zero latency, and the ability to connect numerous devices simultaneously. With its high capacity and low power consumption, 5G has the ability to support a wide range of applications including autonomous vehicles, IoT devices, and smart cities. Additionally, 5G has the potential to bridge the digital divide, providing high-speed connectivity to rural areas and underserved communities. However, there are still challenges to overcome such as the need for extensive infrastructure upgrades and the potential health and privacy concerns. Despite these challenges, 5G technology is poised to create a new era of connectivity and innovation, paving the way for a more interconnected and advanced world.

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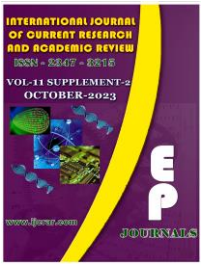

Full Length Article **IJCRAR/FL/38**

Antibacterial Activity of Methanolic Root Extract of Rhizophora apiculata

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Abstract

The mangrove plant of Rhizophora apiculata were collected from the Chennai Rivers Restoration Trust, Adyar Eco park. The plant roots selected for this study. The methanolic root extract of Rhizophora apiculata was subjected to antibacterial activity by disc diffusion method, agar well method and minimum inhibitory concentration methods. Minimum Inhibitory concentration method showed excellent activity even in low concentration against the Gram negative and Gram-positive bacteria. When compared with the standard antibiotics the methanolic root extract of Rhizophora apiculata showed significant antibacterial activity.

Keywords: *Rhizophora apiculata*, Disc diffusion antibacterial, synthetic antibiotic, plants, animals, fungi.

Introduction

Infectious diseases are the world's leading cause of premature deaths. Furthermore, various hard work has been made to discover new antimicrobial compounds from many kinds of natural sources such as plants, animals, fungi, bacteria and other microorganism. It is because the phenomenon that many pathogenic bacteria become resistant to antibiotics. In addition, many synthetic antibiotics smoothly confirm the terrible effect in term of health and bacterial resistance. Contrary to the synthetic antibiotic, antimicrobials of plant origin are not associated with many

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International Journal of Current Research and Academic Review

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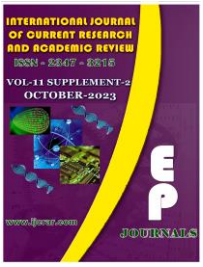


side effects and have an enormous therapeutic potential to heal many infectious diseases (P. Saranraj and D. Sujitha, 2015).

Microorganisms have potential to cause human diseases. Most of time viruses, bacteria and fungi act as major pathogenic organisms. The discovery of antibiotics in the early twentieth century provided an increasingly important tool to combat bacterial diseases. As antibiotics are increasingly used and misused, the bacterial strains become resistant to antibiotics rapidly. Therefore, screening of antibacterial activity of medicinal plants is very important since vast number of medicinal plants have been used for centuries as remedies for human diseases. Among them extracts from different parts of mangroves and mangrove associates are widely used throughout the world (P. Saranraj and D. Sujitha, 2015).

The marine world offers an extremely rich resource for important compounds of structurally novel and biologically active metabolites. It also represents a great challenge which requires inputs from various scientific areas to bring the marine chemical diversity up to its therapeutic potential. So far, many chemically unique compounds of marine origin, with different biological activities, have been isolated and a number of them are under investigation or development. (P. Saranraj and D. Sujitha, 2015). *Rhizophora apiculata* Blume which belongs to family Rhizophoraeceae is an important medicinal plant used in traditional by many people in Asia and Africa. *R. apiculata* Blume has been used as traditional medicine for years with several biological activities such as antioxidant, antibacterial activities (Premanathan *et al.,* 1999).

Materials and Methods

Preparation of Plant Root Extracts Solvent Extraction

Crude plant root extract was prepared by Soxhlet extraction method. About 25g of powdered plant root material was uniformly packed into a thimble and extracted with 150ml of different solvents separately. Solvents used were methanol. The process of extraction was continued for 24h till the solvent in siphon tube of an extractor become colourless. After that the extract was taken in a beaker and kept on hot plate and heated at 30-40^{o}C till all the solvent got evaporated. Dried extract was kept in refrigerator at 4^{o}C for their future use in phytochemical analysis.

Antibacterial Activity: (A) Disc Diffusion Method

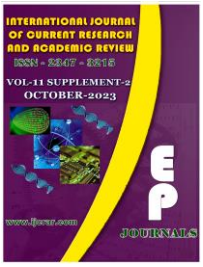
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



To screen the susceptibility of the bacterial strain to standard antibiotic an assay was performed. Kirby-Bauer sensitivity disc technique was employed for this purpose. A bacterial lawn was made with the fresh broth culture of the strains using a sterile cotton swab. On the air dried Muller-Hinton agar plates, the antibiotic discs (Chloramphenical, Methicillin, Penicillin Cefroxime, Kanamycin and Streptomycin) were placed aseptically. The plates were then incubated at 37˚C for 24- 48h. The zone of inhibition was measured and recorded. The bacterial strains used were *Escherichia coli, Escherichia coli* ATCC, *Klebsiella sp, Staphylococcus aureus* and *Staphylococcus aureus* ATCC

Antibacterial Activity of the Extracts against Standard Strains

Antibacterial activity of the methanol extracts of roots of *Rhizophora apicualta* was examined by disc diffusion method. From this mixture, the disc was impregnated with different concentration of the extracts200µg, 250µg, 300µg, and 350µg respectively and kept for drying. After drying the disc were placed on swabbed Muller Hinton Agar plates and the plates were incubated at 37ºC for 24h.

Minimum Inhibitory Concentration (MIC)

MIC was resolved in accordance with the standard microdilution method in 96 well microtitre plate. 250 µl of Muller Hinton broth was added in all wells to that 500 µl of methanolic root extract of *Rhizophora apiculata* were loaded on the first well and it was serially diluted from 10^{-1} to 10^{-7} and then, the 40 µl of test organisms were added into a 96 well microtitre plate. Finally, 40 µl of resazurin dye was added in all the wells. Controls were maintained. The 96 well microtitre plate was incubated for 24 hours at 37°C and evaluated for antimicrobial activity.

Results and Discussion

The antibiotic sensitivity pattern was subjected to all the strains using standard antibiotics. The antimicrobial activity was significantly different when compared to methanolic root extracts of *Rhizophora apiculata*

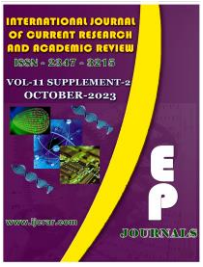
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



The antimicrobial activity of solvent extracts was tested against pathogens and the results showed that methanol extract has excellent antimicrobial activity against all tested pathogens.

According to V. Ramalingam and R. Rajaram, 2018, *Rhizophora apiculata* contains moderate antimicrobial activity against many bacteria. In this study results, the methanolic root extract of *Rhizophora apiculata* contains good antimicrobial activity against many bacteria at their different concentration levels.

According to Mukesh *et al.,* 2012b, the MIC of *Rhizophora apiculata* showed the inhibitory effect at 1mg/ml of concentration against *Staphylococcus aureus*. In this study results, the methanolic root extract of *Rhizophora apiculata* contains good MIC activity against many pathogens like *Staphylococcus* ATCC, *Staphylococcus aureus, E. coli* ATCC, *E.coli, Klebsiella sp.,* at their different concentration levels.

From this study it was concluded that the methanolic root extract of *Rhizophora apiculata* showed significant antibacterial activity against the Gram negative and Gram-positive bacteria.

Table.1 Antimicrobial Activity of Methanolic Root Extract of *Rhizophora Apiculata* against Standard Strains

Sl.No	Organisms	Zone of Inhibition (mm)			
		200µl	250µl	300µl	350µl
1	*E.coli* ATCC	-	-	-	-
2	*E.coli*	10	11	11	12
3	*Klebsiella* sp.,	11	12	15	20
4	*Staphylococcus* ATCC	8	10	11	13
5	*Staphylococcus* sp.,	11	12	13	14

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Table.2 Minimum Inhibitory Concentration (MIC)

Organisms	Methanolic root extract of *Rhizophora apiculata* in Different dilutions (µl)							Control	Result
	T1	T2	T3	T4	T5	T6	T7		
	500	250	125	62.5	31.25	15.625	7.812		
E.Coli ATCC	-	-	-	+	+	+	+	-	**T3 (125 µl)**
E.Coli	-	-	-	+	+	+	+	-	**T2 (250 µl)**
Klebsiella sp.,	-	-	-	+	+	+	+	-	**T3 (125 µl)**
Staphylococcus ATCC	-	-	-	-	+	+	+	-	**T4 (62.5 µl)**
Staphylococcus sp.,	-	-	-	+	+	+	+	-	**T3 (125 µl)**

Table.3 Antibiotic Sensitivity Pattern of Antibiotic Discs Against Standard Strains

Gram Positive

Sl.No	Antibiotic Discs (mcg)	*Staphylococcus* ATCC (mm)	*Staphylococcus* sp., (mm)
1	Chloramphenical	6	-
2	Kanamycin	11	-
3	Methicillin	21	-
4	Penicillin	18	-

Gram Negative

Sl.No	Antibiotic Discs (mcg)	*E.coli* ATCC (mm)	*E.coli* (mm)	*Klebsiella* sp., (mm)	*Vibrio* sp., (mm)
1	Chloramphenical	18	20	19	21
2	Cefroxime	-	-	-	-
3	Penicillin	-	-	-	-
4	Streptomycin	15	-	9	20

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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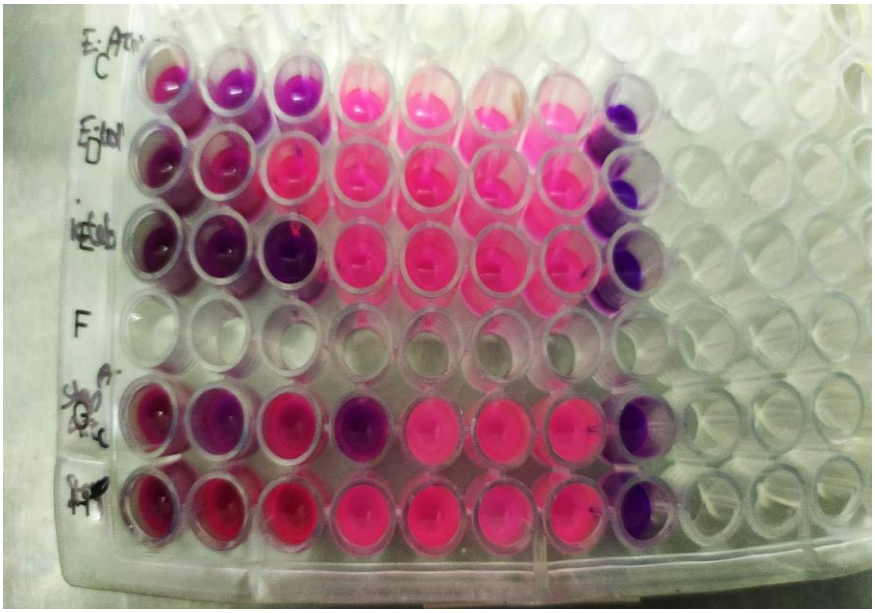
Minimum Inhibitory Concentration (MIC)

Fig.1 Minimum Inhibitory Concentration By Using Methanolic Root Extract of *Rhizophora apiculata*



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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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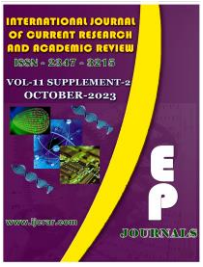

Full Length Article **IJCRAR/FL/39**

Biodegradation of Urban Waste Through Vermicomposting its Effect in the Growth of Solanum lycopersicum

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Abstract

Vermicomposting is a simple biotechnology process of composting, in which a certain species of Earthworm is used to enhance the process of waste conversion and produce a better end product. Five different compost unit were set up with four different wastes (Vegetable waste, Fruit waste, dried leaves, dried leaves with Mask and Mixture of all waste). The waste was allowed to compost for a period of 30 days with intermittent sprinkling of cow dung. The total microbial count of the soil from different compost units found higher in Group 4. Free living Nitrogen fixing Rhizobium, Azotobacter, Azospirillium, Phosphate solubilizers, Actinomycetes were isolated from all the compost units. The compost from different units was used for growing the Tomato plant (Solanum lycopersicum). The parameters that were studied include height of the plant, length of the shoot and root, number of leaves and leaf area index were observed. Hence it was concluded that the plant growth was increased in group 4. Effective degradation of face mask was also observed in group 4 vermicompost unit. Microorganisms and earthworms played a vital role in the degradation of facemask.

Keywords: face mask, dried leaves, earthworms, biofertilizer.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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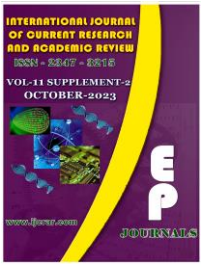

Introduction

During the (COVID-19) pandemic, the utilization of individual defensive gear (PPE, for example, face covers and plastic gloves has risen forcefully (Daryabeigi Zand and Vaezi Heir, 2020; Klemeš *et al.,* 2020; Ludwig-Begall *et al.,* 2020; Prata *et al.,* 2020; Silva *et al.,* 2020; Zambrano-Monserrate *et al.,* 2020; Boroujeni *et al.,* 2021). Numerous nations have carried out compulsory prerequisites for wearing face veils out in the open.

The utilization of face veils by overall communities can lessen the spread of COVID-19; however, it likewise causes extreme issues for the climate. It is assessed that the day by day face cover use in Africa is in excess of 700,000,000, while this number is more than 2.2 billion in Asia consistently (Nzediegwu and Chang, 2020; Rowan and Laffey, 2020; Sangkham, 2020).

Hence, it is expected that presently, the worldwide utilization of facemasks is in excess of 129 billion consistently because of the COVID-19 pandemic. In this manner, discarding the covers or ill-advised waste administration of the pre-owned individual defensive gear can wind up messing up natural life or murdering creatures and marine life (Fadare and Okoffo, 2020; Hirsh, 2020; Prata *et al.,* 2020).

Besides, the single-use veils are made of non-biodegradable plastics, which imply that they enjoy many years to reprieve down in the climate (Dhawan *et al.,* 2019). In this manner, multidisciplinary joint effort is desperately needed to battle against the COVID-19 pandemic and decrease the natural dangers related with the removal of utilized PPE. (Mohammed Saberian *et al.,* 2021)

MSWM is the serious issue being looked by districts since it includes an enormous consumption and gets insufficient consideration (Bhide and Sundersan, 1983). It isn't just a specialized issue however it additionally is unequivocally impacted by political, lawful, socio-social, natural and monetary components, just as accessible assets. Besides, these variables have interrelationships that are normally unpredictable in squander the executive's frameworks (Kum *et al.,* 2005). Numerous urban areas in creating Asian nations deal with significant issues in dealing with their strong waste.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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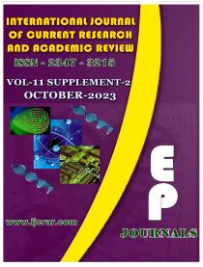


The yearly waste age expansions with respect to the ascent in populace and urbanization, and issues identified with removal have gotten testing as more land is required for a definitive removal of these strong squanders (Idris *et al.,* 2004). MSW is typically discarded in an open dump in numerous Indian urban communities and towns, which isn't the appropriate method of removal in light of the fact that such rough dumps present natural dangers making environmental uneven characters with deference land, water and air contamination (Kansal *et al.,* 1998).

Expanding populace levels, fast monetary development and ascend in local area expectations for everyday comforts will speed up the future MSW age rate inside Indian urban communities. The current yearly amount of strong waste produced in Indian urban areas has expanded from 6 million tons in 1947 to 48 million tons in 1997 with a yearly development pace of 4.25%, and it is required to increment to 300 million tons by 2047 (CPCB, 2004).

Vermicomposting

Vermicomposting is a disintegration cycle including the joint activity of worms and microorganisms. In spite of the fact that microorganisms are liable for the biochemical debasement of natural matter, night crawlers are vital drivers of the cycle, by dividing and moulding the substrate and significantly changing its organic movement.

Night crawlers go about as mechanical blenders and by commuting the natural matter they change its physical and synthetic status, bit by bit decreasing its C:N proportion, expanding the surface region presented to miniature creatures and making it considerably more good for microbial movement and further disintegration.

Vermicompost is a finely partitioned peat-like material with high porosity and water holding limit that contains most supplements in structures that are promptly taken up by the plants. Reusing of rural squanders utilizing night crawlers has become a significant segment of reasonable agribusiness which has a multidirectional sway as far as protected removal of squanders, forestalling natural contamination other than giving supplement rich materials. Despite the fact that microorganisms are answerable for biochemical debasement of natural

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

matter, worms are the significant drivers of the interaction, molding the substrate and adjusting the organic movement (Suthar, S., 2007)

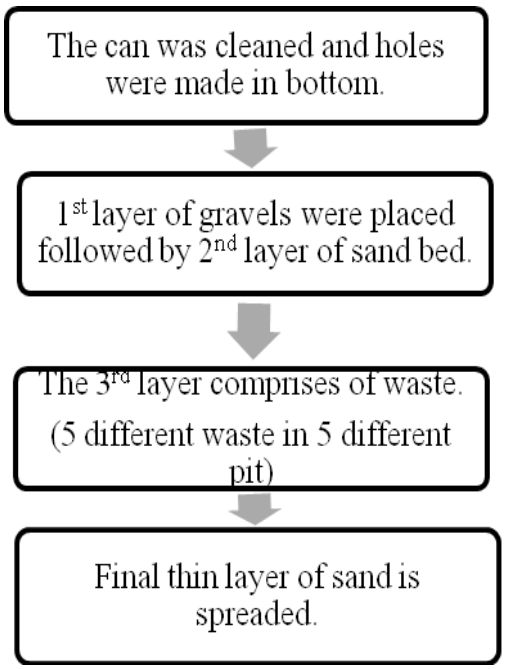
Methodology

Collection of Municipal Solid Waste from Adyar – Chennai

Municipal solid wastes were collected from Adyar –Chennai, Tamil Nadu. After collection of the municipal solid waste they were segregated into five different groups based on the physical properties.

Preparation of Compost Unit

Flow chart.1 Flow chart for the setup of Compost Unit



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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Fig.1

Application of cow dung to the compost unit

After setting up the compost unit water was sprayed to moisten the waste materials and the unit was covered with a polythene cover and left undisturbed for a period of 15 days. After 15 days of decomposition, cow dung water was sprinkled over the decomposed waste to enhance the microbial activity in the decomposed waste.

Inoculation of Earthworm (*Eudrilus eugeniae*) into the Compost Unit

After 15 - 30 days of microbial decomposition, African Nightcrawler (*Eudrilus eugeniae*) was inoculated into the compost unit. To enhance the production of castings the compost unit were wrapped with black polythene sheet.

Microbial analysis of Compost Unit

Enumeration of microbes by Standard Plate Count Method

Soil samples were collected from the compost unit (Group 1 followed by Group 5) before introduction of worm and stored at ambient temperature. One gram of soil sample was dissolved in 100ml of sterile distilled water. The soil sample was serially diluted, from the dilutions ($10^{-5}10^{-6}$ and 10^{-7}).1ml of soil sample was inoculated into the sterilized plate, after inoculating the soil

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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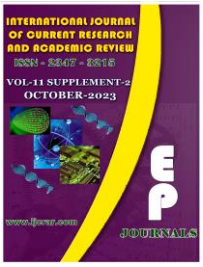
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



sample the plates were poured with sterilized plate count agar. After solidification the plates were incubated at 37 ^{O} C for 24 hrs. After the incubation period results were observed and recorded.

Isolation and identification of free-living Nitrogen Fixing Microbes, Phosphate solubilizers, Actinomycetes from the vermicompost unit

One gram of compost was inoculated into sterile peptone water and kept it in a shaker. And then it was inoculated into the sterile YEMA medium, Jensens medium, Actinomycetes Isolation Agar and Pikovskaya medium. After inoculation the plates were incubated and the results were observed.

Isolation and identification of microflora from the vermicompost unit

One gram of compost was inoculated into sterile peptone water and kept in a shaker. And then it was inoculated into the sterile Nutrient Agar, Sabourauds Dextrose agar. After inoculation the plates were incubated and results were observed.

Isolation and characterization of microorganism from the gut of Earthworm (*Eudilus euginae*)

Collection of Earthworm

The earthworms were collected from compost unit and were transferred into a sterile polythene bag. The earthworm was surface sterilized with sterile water. Then the worm was kept under refrigeration for three to four hours in order to kill them without causing any harm or alteration to the microbial gut content.

Isolation of microbes from the gut

One gram of the gut content was transferred into 10ml of sterile peptone water and kept it in a shaker for overnight. After incubation, one loopful of culture was inoculated on sterile Selective Media plates (Salmonella shigella agar, Xylose lysine deoxycholate agar, Eosin methylene blue agar, Mac conkey agar). After inoculation the plates were incubated and the results were observed and recorded.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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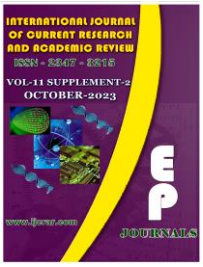
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Identification of Microorganisms from the selective agar plates

From the selective agar plates, well isolated colonies were picked and stored on sterile nutrient agar slants. From this, a loopful was inoculated into sterile nutrient broth, incubated overnight at

Effect of Vermicomposting in Plant Growth

Plant selected for the study

The tomato plant (*Solanum lycopersicum*) was selected for this experiment. Seeds were collected from seeds retails shop in Velachery, Chennai.

Germination studies

Germination study was conducted in the pot filled with 1kg of soil+ 250 gm of vermicompost from different groups (Group 1 followed by Group 5)

Table.1 Field Experiment design for plant growth

POT	SOIL+ VERMICASTINGS	
CONTROL	Total volume of the soil (1250gm)	
POT 1	1kg	250gm vegetable waste
POT 2	1kg	250gm fruit waste
POT 3	1kg	250gm Dried leaves
POT 4	1kg	250gm Dried leaves (75%) + Mask (25%)
POT 5	1kg	250gm Mixing of all waste

Results and Discussion

The results of total microbial count obtained from anaerobic decomposed soil produced by 5 different wastes (vegetable waste, fruit waste, Dried leaves, Dried leaves+ mask and mixing of all wastes) indicated that total number of microorganisms were increased in vegetable waste and

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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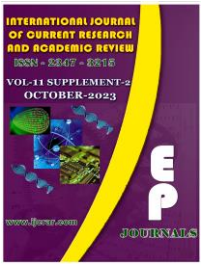

dried leaves + mask wastes compared to other wastes. It shows that microorganism plays a vital role in decomposition process of urban wastes.

Earthworms are soil invertebrates that play a key role in recycling organic matter in soils (Satchell, 1967). They are also 'ecosystem engineers' as they actively redesign the physical structure of the soil environment by their activities of ingesting litter and soil particles, depositing casts on the soil surface and translocating soil particles while their gut, within which many changes take place have been described as 'natural bioreactors'. The activities of earthworms in soils have been shown to have profound impact on the soil ecosystem functioning as well as on the types and numbers of micro-flora and micro-fauna (Pederson *et al.,* 1993). Earthworms ingest soil microorganisms along with organic residues from the soil and during passage through the earthworm's intestinal tract, their population may increase. Earthworm casts have been reported to be much more microbiologically active and richer in micro-flora than their surrounding un-ingested soils (Scheu 1987, Daniel and Anderson, 1992). It has also been reported that while earthworms use organic matter as their nutrient source, the microorganisms ingested along with these nutrient sources actually elaborate the enzymes that make the nutrients available for the worm's use (Edward *et al.,* 1972; Lee 1985).

Vermicompost has been shown to have several positive impacts on soil, plant growth and health. In addition, it is considered as a promising alternative to harmful chemical fertilizers and pesticides in crop production. It is becoming popular as a major component of organic agriculture to produce healthier foods and better option for management of organic solid wastes. Exploration of potential species of earthworms in vermiculture technology along with soil friendly microbes, use of different high nutrient organic substances, efficient vermiculture system, dose specific use of vermicompost, integrated use of vermicompost with other inorganic fertilizers and research on earthworm-microbe interactions provide bright future of vermicompost use in organic farming systems (Janardan Lamichhane, 2017). Bacteria and fungi isolated from the samples were identified by standard microbiological procedures on the bases of their morphological and biochemical characteristics. Isolated bacteria were identified as *Staphylococcus*, *Bacillus* spp., *Pseudomonas aeruginosa*, *Streptococcus mutans*, *Clostridium, Spirocheata* spp., *Azotobacter* spp., *Micrococcus lylae, Acinetobacter* spp., *Halobacterium* for bacteria. Yeast isolates were identified as Candida spp., *Zygosaccharomyces* spp., *Pichia* spp., and *Saccharomyces* spp while molds were

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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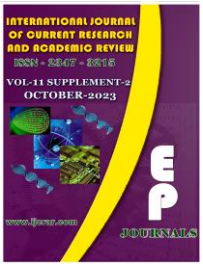

identified as, *Aspergillus* spp., *Pytium* spp., *Penicillium* spp., *Fusarium* spp and *Rhizopus* spp. These results were similar to that of findings of *Owa et al.,* and Vijayakumar *et al.,* 2012.

According to Forde and Lorenzo (2001) root growth and branching is favoured in nutrient-rich environment and in the presence of hormones like auxins that enable the plant to optimize the exploitation of the available resources which are in turn transformed into photo assimilates and transported again to the root consequently influencing plant growth and morphology in a systemic manner. Vermicompost is nutritionally rich natural organic fertilizer, which releases nutrients relatively slowly in the soil and improves quality of the plants along with physical and biological properties of soil. It has a more beneficial impact on plants than soil. Pit compost produces a natural fertilizer and improves the physical, chemical as well as biological properties of the soil. These composts provide all nutrients in readily available forms and also enhances uptake of nutrients by plants and plays a major role in improving growth and yield of different field crops (Amirkhan and Fouzia Ishaq, 2011). Thus it was observed that the vermicompost obtained from Dried leaves with mask waste enhance the growth of Tomato plants at a faster rate in comparison from fruit waste, dried leaves, mixed waste and garden soil.

It can be concluded from this study that the use of Vermicompost resulted in increasing the height of plants and also resulted in decreasing the incidence of diseases in plants. So Vermicompost can be a better option than synthetic fertilizers in increasing the fertility of soil and in turn increasing the productivity. Also, it would reduce the pollution load of our environment. The guts and their contents also had higher moisture and total nitrogen contents than the un-ingested soils.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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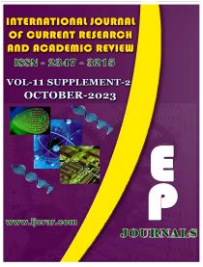

Full Length Article **IJCRAR/FL/40**

Phytochemical Activity of Methanolic Root Extract of Rhizophora apiculate

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Abstract

Mangroves are unique coastal forest ecosystem distributed along the tropical and subtropical region of the world. They are evolutionarily adapted to combat against hostile environmental conditions such as low oxygen, high salinity and temperature. The adaptive features endowed with novel secondary metabolic pathways and bioactive compounds to sustain in harsh conditions. The novel metabolites are rich source of the wide range of bioactive compounds and natural products. It includes terpenoids, alkaloids, phenolics, saponins, flavonoids and steroids (Bandaranayake, 2013). In the present study the qualitative and quantitative determination of phytochemical analysis of the methanolic root extract of Rhizophora apiculata plant were performed.

Keywords: Rhizophora apiculatae, flavanoids, phenols bioactive.

Introduction

Mangrove plants are facultative halophytes, and it is known for its special ultrafiltration system that can filter approximately 90% of Na^+ ions form the surrounding sea water through the roots. The species also exhibits high rate of salt rejection. The time period for the water filtration process in mangrove roots depends upon the quantity of water. Mangrove roots may enact a novel ability of long-lasting desalination of saline water with a high salt rejection. Mangrove plants can reduce salinity in water. This desalination process aims at maintaining the balance of salt in the plant.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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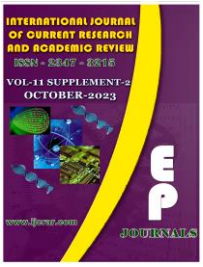

The increased levels of chloride ions in mangrove tissue were influenced by the type of mangrove; an increase occurs in the root tissue of all mangrove plants (Saeni, 1999).

Rhizophora species had more beneficial properties like Desalination, Salt regulation, Photosynthesis, Salt tolerance, Transpiration etc. It has ability to survive and grow in the temperature about 31 ± 3°C, Relative humidity about 73 ± 8% and the Salt level about 3.5%. It was rich in nitrogen and phosphorous source.

Historically, plants have provided a source of inspiration for novel drug compounds, as plant derived medicines have made large contributions to human health and well-being. Medicinal plants represent a rich source of antimicrobial agents. Because of the side effects and the resistance that pathogenic microorganisms build against antibiotics, many scientists have recently paid attention to extracts and biologically active compound isolated from plant species used in herbal medicine. Mangroves are woody trees or shrubs and the salt marsh halophytes are herbs and sledges. The mangrove plants are distributed in 121 countries and Pichavaram mangrove forest is one of the coastal ecosystems of Tamil Nadu, India with rich vegetation. Mangroves are used in traditional medicine for the treatment of many diseases.

Mangrove plants have been used in folklore medicines and extracts from mangrove species have proven inhibitory activity against human, animal and plant pathogens. Several species of mangrove produce bioactive compounds that may control microbial growth. At present, there is a need to search for new antimicrobial agents because infectious diseases are still a global problem because of the development and spread of drug-resistant pathogens. Microbes have been known to be a major source of active compounds used in medicine (*P. Saranraj and D. Sujitha*, 2015). The plant derived secondary metabolites mainly the phenolic and flavonoids can minimise the generation of ROS and alleviate the chronic diseases caused by oxidative stress (Martin-Sanchez *et al.,* 2014).

Rhizophora apiculate Blume which belongs to family Rhizophoraeceae is an important medicinal plant used in traditional by many people in Asia and Africa. *R. apiculata*Blume has been used as traditional medicine for years with several biological activities such as antioxidant, antibacterial activities (Premanathan *et al.,* 1999). It has the diverse source of bioactive metabolites such as

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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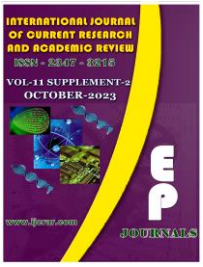

essential oils, limnoids, flavonoids, coumarins, terpenoids, glycosides and alkaloids which contains the economic and traditional folkloric medicinal value (Nilesh Lakshmanrao Dahibhate *et al.*, 2018).

Materials and Methods

Collection of Mangrove Plant

Rhizophora apiculata (mangrove plant) plant was freshly collected from the Chennai Rivers Restoration Trust, Adyar Ecopark.

Preparation of plant root extracts

Solvent extraction

Crude plant root extract was prepared by Soxhlet extraction method. About 25g of powdered plant root material was uniformly packed into a thimble and extracted with 150ml of different solvents separately. Solvents used were methanol. The process of extraction was continued for 24htill the solvent in siphon tube of an extractor become colourless. After that the extract was taken in a beaker and kept on hot plate and heated at 30-40^{o}C till all the solvent got evaporated. Dried extract was kept in refrigerator at 4^{o}C for their future use in phytochemical analysis.

Phytochemical analysis of Crude extracts

Extracts were tested for the presence of active principles such as Tannins, Phlobatannis, Saponins, Flavonoids, Steroids, Alkaloids, Quinones, Coumarin, Terpenoids and Cardiac glycosides.

Test for Tannins

The test solution was mixed with 0.02M potassium ferricyanide and 1 ml of 0.02M ferric chloride containing 0.1M HCL was added. Blue-black colouration indicates the presence of tannins.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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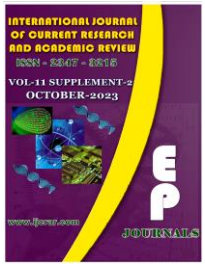

Test for Phlobatannins

Test solution was boiled with 2% aqueous HCl and the deposition of red precipitate indicates presence of phlobatannins**.**

Test for Saponins

The test solution was vigorously shaken with distilled water. Add some drops of olive oil. Appearance of stable foam indicates the presence of saponins.

Test for Flavonoids

The test solution was mixed with 5 ml of dilute ammonia solution and few drops of concentrated H_2SO_4. A yellow colouration indicates the presence of flavonoids.

Test for Steroids

To 0.5ml of test solution 2ml of acetic anhydrite and 2ml of H2SO4 was added. Appearance of blue or green indicated the presence of steroids.

Test for Alkaloids

Test solution was mixed with 2 ml of Wagner's reagent. Reddish-brown precipitate indicates the presence of alkaloids**.**

Test for Quinones

The test solution was treated with dilute NaOH. Blue-green or red coloration indicated the presence of quinones

Test for Coumarin

The test solution was treated with 10% of NaOH followed by chloroform. Yellow coloration indicated the presence of coumarin

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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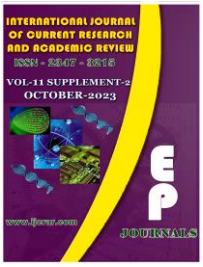

Test for Terpenoids

The test solution was mixed with 2 ml of chloroform and 3 ml of concentrated H_2SO_4. A reddish-brown colouration indicates the presence of terpenoids.

Test for Cardiac Glycosides (Keller-Kiliani Test)

Test solution was treated with 2ml of glacial acetic acid followed by one drop of ferric chloride solution. To that solution 1 ml of concentrated H_2SO_4.A brown ring at the interface indicates a deoxy sugar characteristic of cardenolides. A violet ring may appear below the brown ring, while in the acetic acid, a greenish ring may form just gradually throughout the thin layer.

Quantitative Determination of Phytochemical Constituents

Determination of Total Phenolic Content (TPC)

TPC of the methanolic root extract of *R.apiculata* Blume was determined by the using tannic acid as a standard phenolic compound. The methanolic root extract of *R.apiculata* was diluted with distilled water to a known concentration to obtain the readings within the standard curve range of 0.0 – 600 µg if tannic acid/ml. 250 µl of the diluted methanolic root extract of tannic acid solution was mixed with 1 ml of distilled water in a test tube followed by the addition of 250 µl of Folin-Ciocalteu reagent. The absorbance of the resulting blue colour solution was measured at 760 nm using spectrophotometer after including the samples for 90 minutes.

Determination of Flavonoids

About 10 g of methanolic leaf extract of *R.apiculata* was extracted repeatedly with 100 ml of 80% aqueous methanol at room temperature. The whole solution was filtered through Whatmann's filter paper. The filtrate was allowed to be evaporated into dryness over a water bath and weighed to a constant weight.

Results and Discussion

Rhizophora apiculata roots are of medically important, the roots were dried and the bioactive component was extracted using methanol by soxhlet apparatus. The extraction was subjected to

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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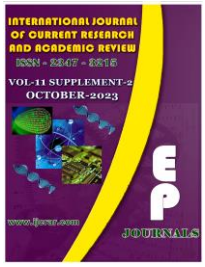

phytochemical analysis and the results were tabulated. The phytochemical screening of solvent extracts showed good Phenol and Flavonoids content that leads for antimicrobial and antioxidant activity. The antimicrobial tannin extracted from *Rhizophora apiculata* can be used as additive and synthetic preservatives in food (Surya *et al.,* 2011). The phenolic compounds are the source of antimicrobial and antioxidant activities.

Table.1 Qualitative Determination of Phytochemical Constituents

Tests	Tannins	Saponins	Flavonoids	Phlobatannins	Steroids
Result	**Positive**	**Positive**	**Positive**	Negative	Negative
Tests	Alkaloids	Quinines	Coumarin	Terpenoids	Cardiac Glycosides
Result	**Positive**	Negative	**Positive**	**Positive**	**Positive**

The amount of Phenolic compounds was increased with the concentration of *Rhizophora apiculata* extracts (Loo *et al.,* Gulcin *et al.,* 2007). Phenols play a significant role in radical scavenging activity owing to their hydroxyl groups (Asha *et al.,* 2012) present in the extract. Further, the previous reports states that the antioxidant property of tannin (Phenol) depends upon the existence of C-ring (Gulcin *et al.,* 2003) and the number of –OH groups present in the extracts (Aleksic and knezevic, 2014). According to V. Ramalingam and R. Rajaram (2018), methanolic extract of *Rhizophora apiculata* showed Reducing power at 100 µg/ml of concentration. The ferric reducing ability of *Rhizophora apiculata* depends on the concentration of the extracts. In this study results, the methanolic root extract of *Rhizophora apiculata* contains the Reducing power at 50 µg/ml.

Table.2 Quantitative Determination of Phytochemical Constituents

Sl.No	Weight of the extract (gm)	Tests	Weight in grams
1	1	Tannic acid	1.84
2	1	Flavonoids	0.87

Phenolic compounds, Flavonoids and tannins are ubiquitous secondary metabolites in plants and well known to be having antioxidant activity, which play a vital role in neutralizing the free radicals and quenching singlet and triplet oxygen. According *to* M. Muthulingam and K. Krishna

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International Journal of Current Research and Academic Review

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Journal home page: http://www.ijcrar.com

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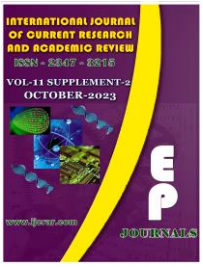

Chaithanya (2018), they found that the methanolic leaf extract of the *Rhizophora apiculata* contain TPC and TFC is 5.45 µg/ml and 8.7 µg/ml. In this study results, the methanolic root extract of *Rhizophora apiculata* contains the TPC and TFC is 18.4 µg/ml and 8.7 µg/ml. From this study it was concluded that the bioactive and natural compounds present in the methanolic root extract of *Rhizophora apiculate* may serve as therapeutic precursors and industrial raw materials

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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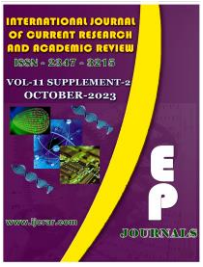
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Full Length Article **IJCRAR/FL/41**

Influence of Gunapaselam - Liquid Biofertilizer on the Growth Characteristic of Solanum melangena and Solanum lycopersicum

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Abstract

Human has been relaying on agriculture throughout the evolution and would be depending on it forever. The impact of globalization, transition in the technology is creating a negative shade on agriculture in the developing countries like India and declined the percentage of the farming community drastically resulting in raising demand for food commodities. The increase in the human consumption of fish results in the production of waste which can be reutilized to reduce their negative impact on the environment. Fish is one of the best animal food rich in proteins, minerals and trace elements. Fermented fish waste, Gunapaselam is found to enrich the soil nutrients for plant growth and also it influences the micorbes in the soil. The effect of liquid biofertilizer treatment on vegetative growth of Solanum melongena and Solanum lycospersicum was significantly higher. A significant variation in plant height and number of leaves due to application of biofertilizerrs was found.

Keywords: Fish waste, biofertilizer, Gunapaselam, Solanum lycospersicum.

Introduction

India is an agricultural based country. In order to feed the ever-growing populations, India has to increase the per unit area productivity. According to united Nations Food and Agriculture Organization (FAO) estimations, the average demand for the agricultural commodities will be

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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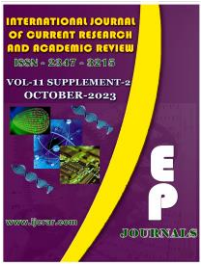

60% higher in 2030 than present time and more than 85% of this additional demand will be from developing countries, for over half a century, the world has relied on the concept of increasing crop yields to supply an ever increasing demand of food. Therefore, vertical expansion of food production is necessary (Mia, Shamsuddin, 2010). In order to increase the unit area productivity of agricultural land, the role of different crop nutrients in contributing increased crop yields is vital. Among the crop nutrients, nitrogen as well as phosphorus plays an important role in increasing the productivity. Fertile soil is the greatest terrestrial stock that supplies all essential nutrients for the growth of healthy and productive plants. Continuous harvesting of the crops results in depletion of the soil fertility. Addition of chemical fertilizers, supply mainly the macronutrients but not all the essential elements for the proper growth and yield of the plants. In recent times, attention has been paid on safer organic foods with high quality. Environmental issues force the reutilization of animal manure, agricultural waste, animal waste etc., in to a better form of the nutrient as a good waste management practice for sustainable agriculture. Composting and fermentation methods have regained focus as they are accepted ecologically. The obtained products are less expensive and promote plant growth. They are non- polluting and therefore safe to use in agriculture (Thendral Hepsibha and Geetha, 2017).

*Solanum melongena Linn. (*Brinjal) belongs to the family Solanaceae is a popular vegetable grown throughout the year in all states of India. It is a good source of nutrients and possesses therapeutic properties. Brinjal requires high quantity of the major nutrients and organic matter for better growth and yield (Narayanamma, 2006). A shift from chemical fertilizers to recycled organic waste will represent a sustainable method of agriculture. Hence, the objective of the study is to evaluate the potential effects of Gunapaselam on the growth characteristics of brinjal.

Materials and Methods

Preparation of Liquid biofertilizer (Gunapaselam)

Take a clean pot of 5 litres capacity and fill with 2.5 litres of water. Then add fish waste, native jaggery and mix it thoroughly. Tie the mouth of the pot with a cotton cloth to prevent the entry of flies. Mix the pot everyday by whirling the contents. After 14 days decant the liquid and use it as organic liquid foliar spray.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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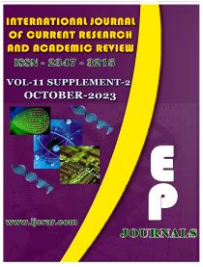

Enumeration of total viable bacterial population

Soil samples from the garden soil were mixed thoroughly with 100 ml of sterile distilled water and were serially diluted up to 10^{-8} using sterile saline solution (0.85% NaCl). Each dilution was spread plated on sterile air-dried nutrient agar plate. The plates were incubated for 24 -48 hrs at 37ºC

Isolation of soil inhabitants from the garden soil

Soil samples from the garden soil were mixed with 10 ml of sterile peptone water, from that 0.1ml was spread plated on sterile potato dextrose agar, Pikovskaya medium, Lowenstein Jensen medium, Starch casein agar, Eosin Methylene Blue agar, Thiosulphate Citrate Bile Salt agar, Mac conkey agar, Mannitol salt agar, Salmonella Shigella agar, Pseudomonas Isolation agar and the plates were incubated based on their parameters.

Preparation of Bioinoculant

From the quadrant streaked Lowenstein Jensen medium, well isolated colonies were picked and stored on sterile Lowenstein Jensen agar slants. From this a loopul was inoculated into 100 ml of sterile Lowenstein Jensen broth incubated at room temperature in shaker for 3 -5 days.

Evaluation of Physical and Chemical properties of the garden soil

(Before and after applying Gunapaselam)

About 500gm of soil samples from the Pot 1 and Pot 3 were transferred to sterile polythene cover the following parameters were analysed. Soil organic condition, Primary nutrients, Secondary nutrients, micronutrients, pH and EC

Experimental Design

Plant selected for this study *Solanum melongena*

Set 1: 25 days old healthy plantlets were planted in the clay pots with different groupings. The groupings were Group 1 – Control, Group 2 – Chemical fertilizer (Urea), Group 3 – Gunapaselam,

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International Journal of Current Research and Academic Review

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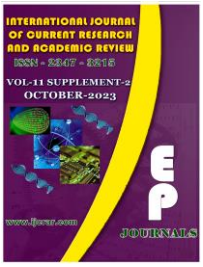

and Group 4 – Bioinoculant. Water / diluted Gunapaselam were added to the respective treatment pots based on the requirement of *Solanum lycopersicum*

Set 2: 7 days old healthy plantlets were planted in the clay pots with different groupings. The groupings were Group 1 – Control, Group 2 – Gunapaselam and Group 3 – Bioinoculant. Water / diluted Gunapaselam were added to the respective treatment pots based on the requirement

Analysis of vegetative growth characters of *Solanum melongena* and *Solanum lycopersicum*

The leaf area and plant height were measured for 6 weeks after transplantation in to the pot using meter ruler for the plants selected for this study.

Results and Discussion

In this study Gunapaselam was prepared from fish waste by fermentation. Fish waste is a great source of minerals, proteins, fat and carbohydrates. Addition of rich carbohydrate source like molasses (Samaddar and Kaviraj, 2014) or jaggery (Vincent *et al.,* 2014) to the fish waste, under enough moisture(Rani Singhania and Kumar Patel, 2009) facilitates the ferementation process as the fish offal or molasses are very good sources of native microbes (Samaddar and Kaviraj, 2014). The presence of huge microbial population like ammonifiers, nitrifiers, phosphate solubilisers (Vincent *et al.,* 2014) bring out fermentation. The production of acids like lactic acid, acetic acid and carbonic acid decrease the pH of the fermented medium to 4.0 which prevents the fermented product from spoilage (Lee *et al.,* 2004). The decrease in the soil pH after Gunapaselam application was due to the production of organic acids. It is well known that nutrient uptake and its availability to the crops were influenced by soil pH (Gordon, 1988). This investigation correlates with our present studies; the pH of the pot soil before applying the gunapaselam was slightly alkaline. But after applying the Gunapaselam the pH was neutral.

Fermentation of fish waste produces significant amount of organic acids, lactic acids and acetic acid (Samaddar and Kaviraj, 2014) which activates mineral phosphate solubilisation and P-solubilisers (Antoun and Kloepper, 2001) like *Rhizobium* (Halder *et al.,* 1991) and *Bacillus* (Yuming *et al.,* 2003). Besides increasing the soil phosphorus level, phosphate solubilisers also increase the

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International Journal of Current Research and Academic Review

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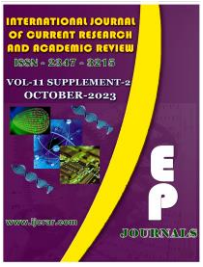

nitrogen fixation, trace elements and plant hormones (Gyaneshwar *et al.,* 2008). This observation correlates with our present study, Actinomycetes, free living nitrogen fixers like *Azospirillum,* fungi and gram positive, gram negative bacteria were isolated from the soil treated with gunapaselam, and it shows that gunapaselam enhances the microbial load, which also plays a role in the growth of the plants. Khaleed *et al.,* (2003) has reported that fish emulsion was found to be the best growth medium for the bacteria and actinomycete isolates that promotes the growth of raddish.

The increase in leaf area could be due to the enhanced availability of the nutrients particularly nitrogen which promotes the leaf area and function, increased cell division and elongation. The obtained are in accordance with the report in Okra (Allah *et al.,* 2013) brinjal, chilli and tomato (Roy *et al.,* 2013). Gunapaselam treated plants had increased shoot length, the organic matter increases the soil porosity and reduces soil bulk density (Passioura JB, 2002) and also on decomposition released humic and felvic acids that leads the production of auxin or auxin like substances (Trevisan *et al.,* 2010).

Significant differences in internode length and stem diameter were detected in gunapaselam treated when compared with urea fertilizer and control group. The increase in the stem diameter and fresh plant weight of the whole plant was due to the ample availability of plant nutrients, favourable soil conditions, sufficient water availability which leads to the luxurious growth of the brinjal and tomato plant. Similar trends were noted in the findings of many workers (AB Elham *et al.,* 2013). Mathowa *et al.,* (2012) observed decrease in the stem diameter when the soil nutrients were depleted.

Azospirillum cultures synthesize considerable amount of biologically active substances like vitamins, nicotinic acid, indole acetic acid, gibberellins. All these hormones help plants in better germination, early emergence and better root development (Pavan Kumar Pindi and Sathyanarayana, 2012). In the present study, *Azospirillum* used as a liquid biofertilizer, but very surprisingly the pot supplemented with gunapaselam showed significant growth when compared with pot supplemented with *Azospirillum.* Trace elements are essential for physiological and biochemical processes of plants besides the macronutrients. Integrity of the cell membrane, seed formation, elongation of roots and sugar metabolism are governed by Boron (Ali and Jarvis,

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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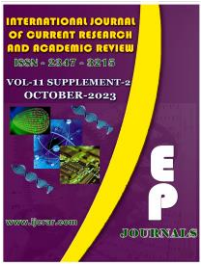

1998). In the present study the amount of B increases in the soil when the plant was supplemented with gunapaselam (Table). The increase in plant height of *Vigna radiate* induced by Gunapaselam was due to the attainment of threshold turgor for stem cell elongation under good moisture condition and the plant will harvest better sunlight for more photosynthates (Thendral and Geetha, 2017). The increase in plant height was contributed by boron which promotes division and differentiation of cells controlling cellular and metabolic activities (Nason and McElory, 1963).

Table.1 Physical and Chemical properties of soil with and without applying Gunapaselam

Sample	Soil organic condition		Primary Nutrients kg/acre			Secondary Nutreints mg/kg			Micro nutrients mg/ kg					pH	EC ds/cm
	Organic carbon %	Humus kg/acre	N	P	K	Ca	Mg	S	Fe	Mn	Cu	B	Zn		
Soil without gunapaselam	L	H	M	H	H	S	H	H	H	H	L	**D**	M	**Alk**	**M**
Soil with Gunapaselam	L	H	M	H	H	S	H	H	M	H	L	**S**	M	**N**	**L**

Gunapaselam, the fermented fish waste was found to be a biological preparation epitomizing as a sufficient source of micronutrients and microorganisms. The tangible beneficial role of Gunapaselam was evidenced by providing a proper rhizosphere with beneficial microbes for the growth of *Solanum melongena* and *Solanum lycospersicum.* The treatment with Gunapaselam has promoted the plant growth, increase in the number of leaves and increase in stem diameter when compared with chemical fertilizer, *Azospirillim* and untreated water control. The results suggested that preparation of Gunapaselam by treatment of fish waste will reduce the environmental burden of solid wastes and also it would be an inexpensive alternative to chemical fertilizers to promote the growth of vegetables.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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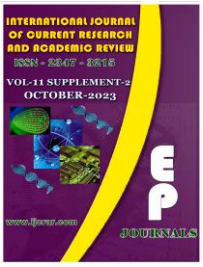

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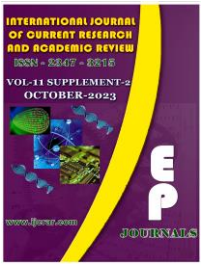

Full Length Article **IJCRAR/FL/42**

Assessment of Biodegradation of Face Mask in an Experimental Setup and Evaluation of its Biodegradability by Potential Bacterial Strains

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Abstract

The global spread of the SARS-CoV-2 pandemic has brought out considerable and widespread socioeconomic damage and has urged the need for the development of sustainable strategies in reducing transmission of infection. As a result, disposable facemasks of plastic were mandatory preventive measure across the world. This discarded facemask has been fragmented into microplastics and contaminate the environment. In order to overcome the negative environmental issues in the disposal of facemasks, an experimental setup in biodegradation of face mask by microorganisms was conducted. In this study, face masks were subjected to biodegradation in an experimental setup for a period of 45 days with two potential bacterial isolates, FTIR analysis confirmed the biodegradation of the mask and the highest percentage of weight reduction was observed in a short span. Thus, face mask could be effectively biodegraded instead of discarding as municipal waste in the dump yard.

Keywords: Face masks, Plastic biodegradation, FTIR analysis, polystyrene, polycarbonate.

Introduction

At the beginning of the pandemic, the use of medical mask as an infection control measure was wide- spread in East and South–east Asia, and later spread across rest of the world. Medical mask

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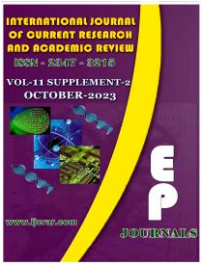

usage and production are currently at massive levels, and both are anticipated to rise further soon. For instance, China made roughly 450 million medical masks every day as of April 2020, World's largest producer and manufactured 5 billion in 2019 and expected to produce 10 billion medical masks by 2020 (Fadare & Okoffo (2020). Major countries of face mask production have scaled up the output with increase in the demand, however relaxations of use of face masks in 2021 due to a reduced number of infections has led to decreased production but also could lead to series of outbreak subsequently. The plastic waste production estimated to be more than one lakh tonnes in India due to the increased usage of face mask and being the second highest in the World in the pandemic era (Shukla, *et al.,* 2022).

Disposable face masks are made of polymers such as polypropylene, polyurethane, polyacrylonitrile, polystyrene, polycarbonate, polyethylene or polyester (Potluri and Needham, 2005). Plastics include polythene, propylene, polystyrene, polyurethane, nylon etc. Polyethylene either LDPE (low density polyethylene) or HDPE (high density polyethylene) is a thermoplastic polymer made by monomers of ethylene, used mostly as thin films and packaging sheets.

Light-weight, inertness, durability, strength and low cost are the main advantages of plastic while it has disadvantages such as, it is recalcitrant to biodegradation and difficult to degrade naturally (Dharmaraj, S. *et al.,* 2021). In the present circumstances, three types of face masks being used such as Respirator Mask (N95, FFP2), Surgical or Medical mask and a non-certified disposable mask (Cloth mask). The top and bottom layers of disposable (one-time use) face masks were woven fabric, while center layer was formed of melting polypropylene polymers. Each day, the models are predicted to generate 6.88 billion (around 206,470 tonnes) of material, subsequently disposed of or burnt.

In order to overcome the negative environmental issues due to the pandemic situation this present study is to reduce the pandemic–generated waste disposal of surgical mask in an innovative way (Mentari, A. E., & Khoironi, A. 2022). One of the best and eco-friendly approaches is the use of microorganisms for biodegradation of disposal of waste surgical mask into soil. Microorganisms were well suited for the biodegradation process because they possess enzymes and their small size, allowing them to contact the plastic surface. exoenzymes from bacteria that

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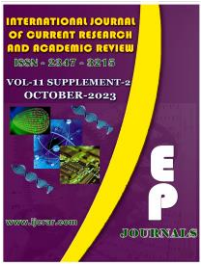

break down complex polymers into simpler ones to pass through semipermeable outer membranes and be used as carbon and energy sources by the microbes (Sen S. K., Raut S. (2016).

Microorganisms such as bacteria and fungi reported in degradation of polypropylene, which is second most widely used plastics after polyethylene. Bacteria such as Pseudomonas, Vibrio and Bacillus strains degraded high impact polystyrene in a one-month time span (Mohan, A. J., *et al.,* 2016). *Aspergillus niger* have also been reported for its degrading ability of polypropylene.

The emergence of facemasks litters the environment and pose a potential threat in further spread of infection. Interventions are necessary to manage the global impact of microplastics contamination (Nabi *et al.,* 2023). This study attempts to find a simple solution with the use of microorganisms in initiating the degradations of face masks and evaluating the degradation ability for a short period in an environmentally acceptable manner to safeguard our environment from pandemic-related garbage.

Materials and Methods

Collection of samples

The soil sample was collected from waste dump sites and lake shore in Pallikaranani, Chennai. It was packed in a sterile collection bag and securely transported to the laboratory. Two soil types dump soil and lake shore soil were used in soil burial method for biodegradation setup. Face masks used in this study were both unused and used masks (Selvakumar, V *et al.,* 2021)

Isolation of bacteria from soil sample

Soil sample from waste dump site was serially diluted and plated onto nutrient agar (NA) medium incubated at 37°C for 24 hours to isolate bacteria. After the incubation, individual colonies were obtained and subjected to preliminary identification tests such as Gram staining, hanging drop experiment, catalase and oxidase test. The obtained isolates were further subjected to biochemical tests such as Indole test, MR VP test, citrate utilization test and Triple sugar iron test for the identification.

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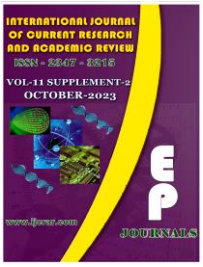

Simulation Test for Face Mask Biodegradation

A modified version of soil burial method was performed in a small experimental setup for a study period of 45 days. Three plastic trays of size measuring 10x14 cm was used for the biodegradation test, it was surface sterilized, perforated underneath and filled with dump soil up to 15 cm depth. Mask were stripped of their metal strips and ear loops were removed. Mask was weighed and cut into 3x3 cm size pieces for this experimental setup (Shovitri, M *et al.,* 2017).

The first tray consists of dump soil buried with used face mask, second tray consists of dump soil buried with unused face mask and third tray consist of lake soil buried with unused mask as control. The setup was placed in the open place and watered periodically and monitored for a period of 45 days at room temperature (Knicker, H., & Velasco-Molina, M. 2022).

Laboratory Test for Face Mask Biodegradation

Pretreatment of Mask

Mask were stripped of their metal strips and ear loops were removed, cut into 3x3 cm sizes and treated with solution of 7 ml of Tween 80, 10 ml bleach 983 ml of distilled water for 30 minutes with continuous stirring. Then mask pieces were washed with distilled water, surface sterilized with 70% ethanol and dried at 45^0C. After drying, initial weight of the mask pieces was weighed and noted.

Biodegradation Experimental Setup

Biodegradation experimental setup in laboratory conditions was performed for the mask pieces through Carpet culture method was done with isolates obtained from the dump soil. There are two isolates which were obtained was swabbed on to nutrient agar medium and 0.1g of used mask pieces and unused mask being pretreated was placed over the inoculated plates with sterile forceps and incubated at 37°C for 30 days. Negative control was maintained with the uninoculated nutrient medium with 0.1 g of mask pieces. Similarly, nutrient broth medium was

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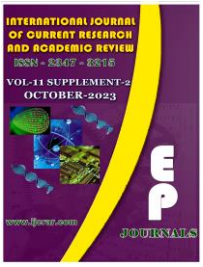

prepared and 0.1 g of used mask pieces and unused mask being pretreated was mixed in it and inoculated with each of the isolated bacteria respectively and incubated at 37^0C for 30 days.

Viability Test

The viability of the bacteria adhering to the surface of face mask buried in the soil as in simulation test for 45 days and laboratory test after 30 days was determined. Face masks was taken out aseptically, washed in 0.85% saline and was serially diluted up to 10^7 dilution and plated onto nutrient agar medium incubated at 37^0C for 24 hours. The colonies were counted and number of viable bacteria was calculated and tabulated.

Determination of Dry Weight of Face Masks

The residual mask recovered from both the experimental setup was determined after 45 days and 30 days respectively. The bacterial biomass attached on the face masks were treated with 2% SDS solution for 2 hours, then rinsed with distilled water and dried overnight at 45^0C. The degraded mask pieces were weighed in a weighing balance and percentage of biodegradation was calculated by:

$$\text{Biodegradation (\%)} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

FTIR analysis

After the incubation for a specified time, the structural changes in the face mask after biodegradation experiment was assessed by Fourier Transform Infrared Spectroscopic analysis. The face masks which showed significant reduction in the weight only was further evaluated for its structural changes by FTIR spectra.

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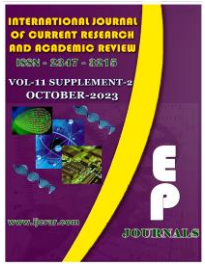

Results

Bacterial isolates were subjected to preliminary and biochemical identification tests and the bacterial isolates were identified as *Bacillus sp* and *Pseudomonas sp* respectively. From the experimental setup of simulation test and laboratory test for biodegradation that includes carpet culture and broth method was analyzed for its weight reduction (Figure.1 & 2) The viability of the bacteria attached to the masks were determined by colony count and tabulated in CFU/ml. (Table.1).

Bacteria was isolated from the dump soil and two isolates obtained from the dump soil such as *Bacillus* sp and *Pseudomonas* sp in this study, they are being used as a potential agent in the biodegradation of plastics as in a study conducted in Tiruchirappalli district where face masks were treated with bacteria isolated from soil of plastic dump sites (Selvakumar, V *et al.,* 2021).

These two isolates were used in the soil burial method in plastic degradation and its influence of biofilm formation was investigated (Shovitri, M *et al.,* 2017). Similarly, a modified version of soil burial method as simulation test was performed for incubations period of 45 days instead of 16 weeks.

Table.1 Viability Test of simulation test and laboratory test

S. No	Samples	No. of colonies (CFU/ml)	No. of colonies CFU/ml
1.	Used mask in dump soil	$1.87x10^{-7}$	$1.68x10^{-7}$
2.	Unused mask in dump soil	$1.52x10^{-6}$	$1.62x10^{-6}$
3.	Unused mask in lake soil	$1.15x10^{-6}$	$1.04x10^{-6}$
4.	Used mask in Nutrient broth with *Pseudomonas sp*	$2.15x10^{-7}$	$1.24x10^{-7}$
5.	Used mask in Nutrient agar with *Pseudomonas sp*	$2.11x10^{-6}$	$1.57x10^{-6}$

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Fig.1 Weight loss by Simulation test

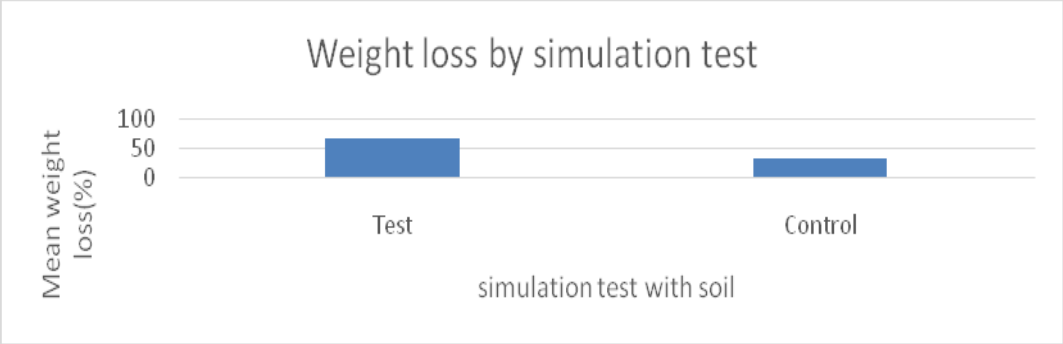
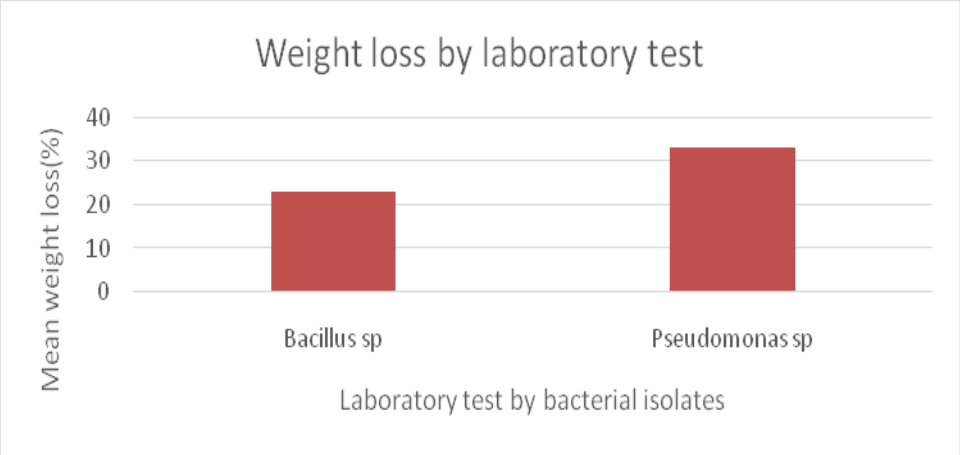


Fig.2 Weight loss by Laboratory test



The residual mask recovered from simulation experimental and laboratory setup was determined for its weight loss after 45 and 30 days The highest weight reduction was recorded in simulation test in used mask in dump soil, whereas highest weight reduction was recorded in laboratory test in used mask with *Pseudomonas* sp and the least weight reduction was recorded in laboratory test in used mask with Bacillus sp, Laboratory biodegradation experiment setup was carried out as in Selvakumar, V *et al.,* 2021, where only basal medium of growth was used instead of different

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

media sources in this study. The viability test results observed highest on 20-day interval of 2.02×10^7 CFU/ml, but the present study showed similar findings with highest growth in nutrient broth with Pseudomonas sp of $2.15x\times10^7$ CFU/ml. The weight determination of face mask has a crucial impact as it determines the further proceeded with FTIR analysis. The FTIR results of mask pieces taken after specified number of days of degradation of soil samples and the peaks confirmed the changes in the functional group.

Fig.3 Standard FTIR of polypropylene overtime (Amadi, L. O., and Nosayame, T. O., 2020).

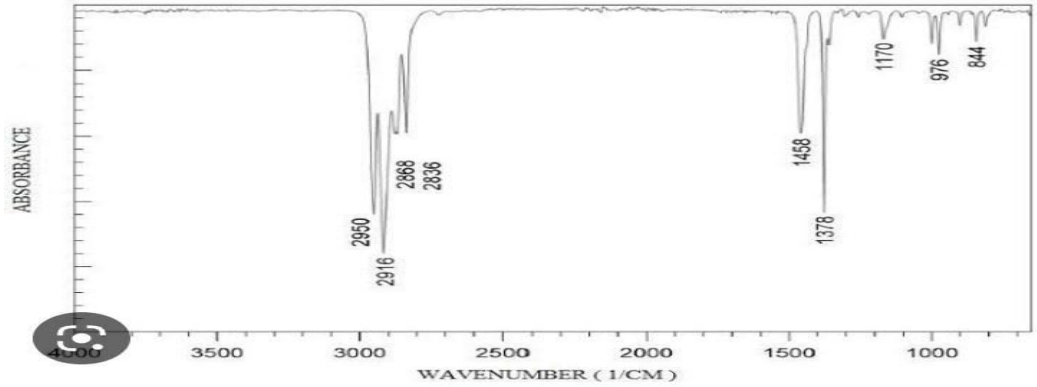
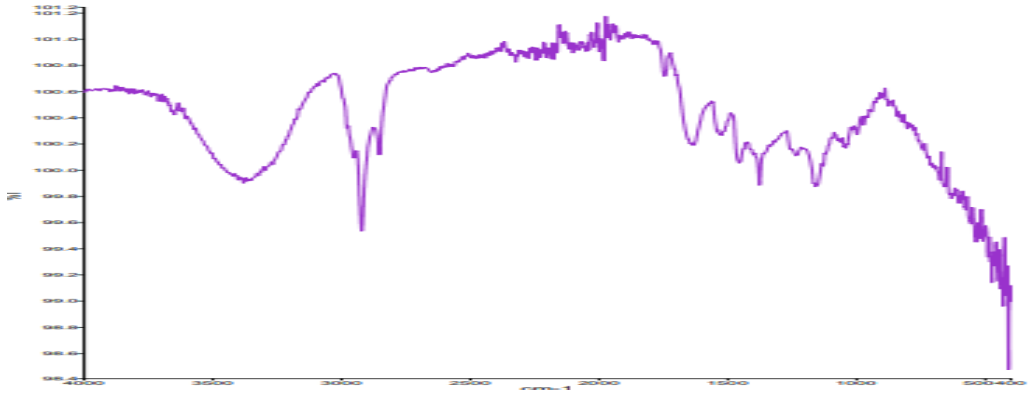


Fig.4 FTIR spectra of lake soil with unused mask



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International Journal of Current Research and Academic Review

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Fig.5 FTIR spectra of Dump soil with used mask

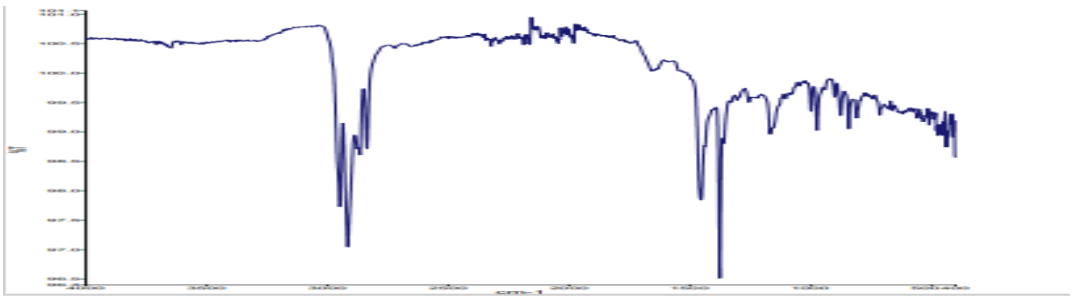

Fig.6 FTIR spectra of Dump soil with unused mask

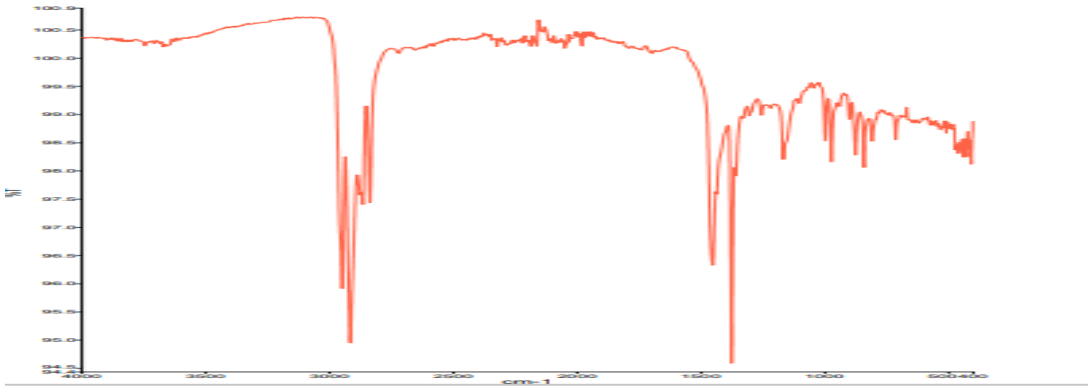

Fig.7 FTIR spectra of Pseudomonas sp on Nutrient Broth with used mask

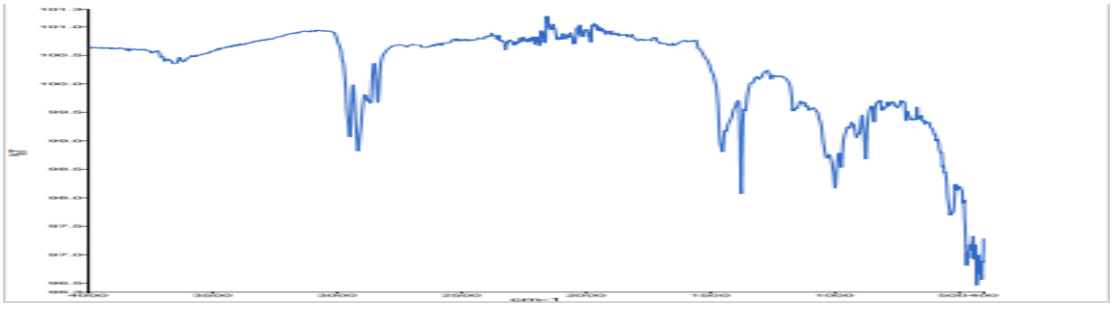

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Fig.8 FTIR spectra of Pseudomonas sp on Nutrient Agar with unused mask

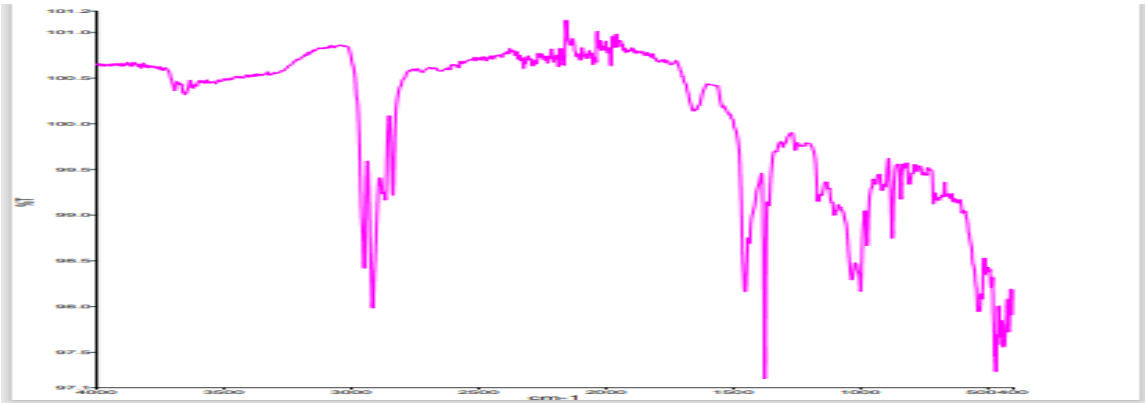
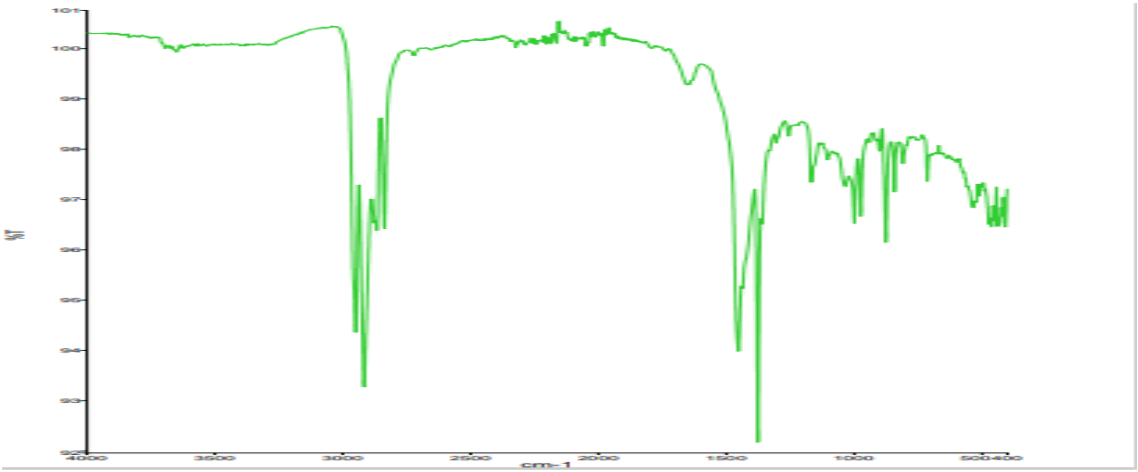


Fig.9 FTIR spectra of Nutrient Agar without inoculum with unused mask



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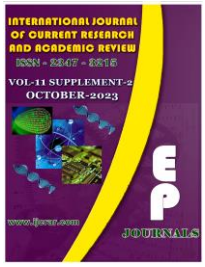

Table.2 Comparison of IR spectra on degradation of face mask after 45 and 30 days of incubation

S.NO	Nature of the sample	Infrared Spectra (cm^{-1})	Standard FTIR ((cm^{-1})	Functional group involved
1.	FTIR spectra of lake soil with unused mask	574.12-458.98	462.00-458.35	Strong stretching Halo compound
2.	FTIR spectra of Dump soil with used mask	1456.09-1375.63	1456.52-1357.63	C-H bending alkane
3.	FTIR spectra of Dump soil with unused mask	2950.14-2838.93	2952.00-2917.14	C-H stretching Alkane
4.	FTIR spectra of Pseudomonas sp on Nutrient Broth with used mask	3189.95-3142.44	3073.12-31330.22	C-H stretching Alkene
5.	FTIR spectra of Pseudomonas sp on Nutrient Agar with unused mask	2839.02-2722.15	2839.57-2838.65	O-H stretching Alcohol
6.	FTIR spectra of Nutrient Agar without inoculum with unused mask	2916.76-2838.83	2918.00-2917.14	C-H stretching Alkane

FTIR results clearly indicates the biodegradation of polypropylene of face mask overtime as standard in Figure 3. All the FTIR spectra of the mask used in both simulation and laboratory experiment from Figure 4 to 9 were compared with the standard FTIR spectra and bonds and functional groups involved are tabulated in the Table 2. FTIR analysis and IR spectra with functional groups involved was compared with polypropylene standard overtime and the peaks showed a consistent match with similar observations (Gajendiran, A., Krishnamoorthy, S., & Abraham, J., 2016). The peaks were found to be attenuated as their transmittance percentage was decreasing which shows that chemical bonds between the compounds were loosening leading to the change in the chemical functional groups (Shovitri, M *et al.,* 2017).

Conclusion

This study has attempted to exhibit a small experimental setup of biodegradable pit for face masks used on a daily basis to be buried, degraded and further use it to grow herbs in all households rather than dumping masks in the municipal or domestic waste yard. Thereby with a

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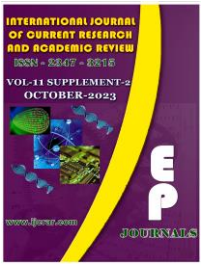

simple setup at every home could prevent accumulation of plastic made masks in reaching the water bodies and oceans thus creating a less hazardous environment through biodegradation by potential bacteria.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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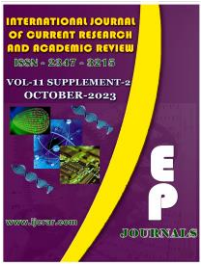

Full Length Article **IJCRAR/FL/43**

Isolation Identification and Characterization of Nitrobacter and Nitrosomonas from Free Floating Aquaponic Unit

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Abstract

Aquaponics a solution for a less energy intensive source of nutrients, where waste-water from tanked fish is used to feed the plants. The external source of nutrients in an aquaponics system is the food for the fish. This can be home made, but similar to hydroponics nutrients, they need to be carefully formulated to ensure there is a balance of nutrients for the plants and the fish Aquaponic unit was set and the water sample was analyzed for the presence of heterotrophic bacterial population by standard plate count. The bacterial load was high when the aquaponic unit was fitted with free floating system with plants. It also further confirmed by the presence of Ammonifiers, Nitrifiers and Denitrifiers in the Aquaponic unit. Hence it was again proved by identifying and, characterizing the presence of Nitrosomonas and Nitrobacter form the aquaponic unit. Due to the presence of these nitrifying microbes the plant selected for this study showed excellent growth when it was compared with the plant grown in earthen pot.

Keywords: Aquaponics, Fish, Plants, Nitrosomonas, Nitrobacter.

Introduction

Food production and consumption for cities has become a global concern due to increasing numbers of people living in urban areas, threatening food security. There is the contention that people living in cities have become disconnected with food production, leading to reduced

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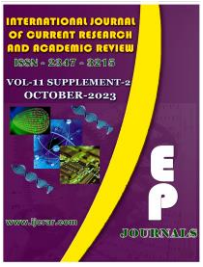

nutrition in diets and increased food waste. Alternative food production such as Aquaponic provides an opportunity to less on those effects.

Aquaponic, which combines fish farming and growing plants without the use of soil, could potentially present a chance for local communities to have more control of the food that they are eating while also presenting savings in the costs ofproducing that food. One of the benefits of Aquaponic is potentially a substantial reduction in the amount of water needed to grow plants as well as additional resources as a system that uses fish waste to provide nutrients to the plants.

The term "Aquaponic" is derived from the "aqua" in aquaculture and "ponics" in hydroponics. Aquaculture is fish farming, where fish are grown in a controlled environment. A disadvantage of aquaculture is that the water must be treated to control ammonia, which is released in fish waste, in order for the fish to survive.In hydroponics, plants grow in water, but nutrients must be added to the water in order to feed the plants. Aquaponic uses the fish waste in aquaculture (nutrients such as nitrogen-containing ammonia) as the food for plants grown in water (hydroponics). This process is the same as that occurring in nature, such as in a river or lake basin, where plants and fish live together.

Biological process in Aquaponic

The most important biological process in Aquaponic is the nitrification process, Nitrification is the biological oxidation of ammonia to nitrate via the intermediary nitrite. Nitrification is an important step in the nitrogen cycle in soil. The process of complete nitrification may occur through separate organisms or entirely within one organism.Also, atmospheric nitrogen can be fixed through an energy-intensive manufacturing process known as the Haber process, used to produce synthetic fertilizers.

Other decaying organic matter found in nature, such as dead plants or animals, is broken down by fungi and different bacteria groups into ammonia. This ammonia is metabolized by a specific group of bacteria, which is very important for Aquaponic, called nitrifying bacteria. These bacteria first convert the ammonia into nitrite compounds (NO2-) and then finally into nitrate compounds (NO3-).

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International Journal of Current Research and Academic Review

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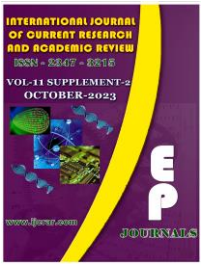

Materials and Methods

Construction of Aquaponic Unit

Floating Raft Unit

A glass fish tank is taken which is filled with gravels and ¾ of the tank was filled with ground water. Then the fish is allowed in a tank. The ornamental fish used in this study was shark. A plasticsetup filled with hydro tons was fixed in the upper side of the fish tank.

Enumeration of Total Viable Bacterial Population

About 1ml of water samples collected from the fish tank was serially diluted up to 10-7 using sterile saline solution (0.85% NaCl). Each dilution was spread plated on sterile air-dried nutrient agar plate. The plates were incubated for 24 – 48 hrs at 37^{o}C.

Isolation of Ammonifiers, Nitrifiers and Denitrifiers from the Floating raft Aquaponic Unit: Ammonifiers

A loopful of water sample from the aquaponic unit was taken and inoculated in a sterile peptone broth. The tube was then incubated in a room temperature for 5 to 7 days. Controls were maintained. After the incubation few drops of Nessler's reagent was added and the results were observed and recorded.

Nitrifiers

A loopul of water sample from the aquaponic unit was inoculated into a sterile Ammonia sulfate broth and the tubes were incubated at room temperature for 5-7 days.Results observed.

Denitrifiers

A loopful of water sample from the aquaponic unit was inoculated into a sterile nitrite broth. And the tubes with the Durham's tube were incubated at room temperature for 5-7 days.

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International Journal of Current Research and Academic Review

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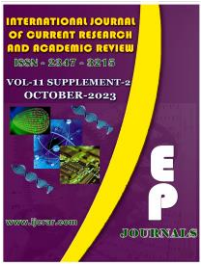

Identification of ammonifiers

The water sample from the aquaponic unit was streaked on sterile peptone yeast extract mannitol plate. The plates were incubated at 37°c for 24 hours. After incubation, well isolated colonies were picked and stored on sterile nutrient agar slants. From this, a loopful was inoculated into sterile nutrient broth, incubated overnight at 37°C and used for identification purpose.

Modified winogradsky medium

The Winogradsky mediawas dissolved in 50ml distilled water and autoclaved. The media was then poured into a sterilized plate and allowed to solidify. Samples were collected from the aquaculture and streaked into a sterilized modified winogradsky medium (phase 1 medium). Then it was incubated at 37c for 24 hours. After overnight incubation the plates were observed for isolated colonies.

Modified winogradsky medium

The media was dissolved in 50ml distilled water and sterilized. After sterilization the media was poured into a steriled petri plates and solidified. The sample was streaked into the modified winogradsky medium and incubated at 37c for 24 hours. After incubation the plates were observed for isolated colonies

Results and Discussion

Aquaponics is a big hope for sustainable organic crop production, aquaculture and water consumption. The fish waste is recycled and used for plant growth instead of throwing it in the ocean.The plant growth analysis of *Solanum lycopersicum* commonly called as tomato was selected for this study. After setting the aquaponic unit the water was analyzed for their total viable count with and without plant. For analyzing the heterotrophic bacterial population, standard techniques were adopted. By analyzing the results of TVC the bacterial load was found to be increased in aquaponic unit with plant was probably due to the availability of nutrients from the plant roots. The major source of nitrogen input in aquaponicsystems is fish feed, which is excreted by the fish in the formof ammonia nitrogen (90%). Thus, ammonia nitrogen excreted by

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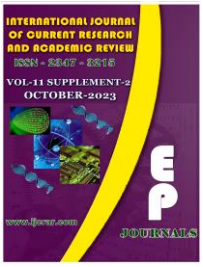

fish provides nitrogen source for plantgrowth. As the aquaculture effluent flows into the hydroponic component, nutrients are transformed by biological nitrification anddenitrification, and assimilation by plants in the form of nitrate (NO3−) and ammonium (NH4+) (Graber and Junge, 2009; Zou *et al.*, 2016). Simultaneously ammonifiers are isolated and confirmed by the presence of grey white colonies in peptone yeast extract mannitol agar. According to our report *Nitrobacter* was confirmed by the presence of reddish color in nitrite calcium carbonate broth and mucoid colonies in Winogradsky medium phase II. Presence of *Nitrosomonas* is also confirmed by the appearance of brownish colonies in Winogradsky medium phase I.

In this background, the plant growth of *Solanum lycopersicum* was analyzed for its shoot length and number of leaves. When compared to the plant grown in earthern pot the shoot length was fivefold increase in aquaponic unit, likewise the number of leaves also increased. The plants growing in aquaponic systems uptake NO3−as themain nitrogen source because NO3−concentration in aquaponicsystems is higher than NH4+and NO2−concentrations. Inside the root, water and dissolvedminerals are transported via xylem for photosynthesis. The movement of water and minerals are translocated by capillary forcein the interconnecting organs and the evaporation from plant'sleaves, leading to the suction of water and minerals (Sumeth Wongkiew *et al.*, 2017). Aquaponics has great potential to becomea sustainable technology for nitrogen rich waste remediation with simultaneous year-round production of high-quality fish and vegetables while conserving the water.

Fig.1 Growth of *Solanum lycospersicum* in Aquaponic unit and Earthen Pot

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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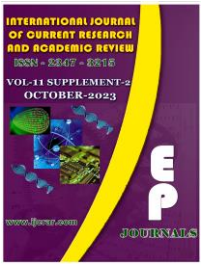

Conclusion

Aquaponics is a potential sustainable food production system that integrates aquaculture with hydroponics in which nitrogen-rich effluent from the fish production is utilized for plant growth. Because nitrogen is one of the most important inputs in an aquaponic system, it is critical to investigate the nitrogen transformations in the system for enhanced recovery of resourcesHence it was concluded that the fundamental understanding of nitrogen transformations could be applied for improving Nitrogen Utilization Eficiency (NUE) in an aquaponic system. However, quantitative parameters (e.g., generation rates of different forms of nitrogen, and yields of fish and plants) differ from system to system due to the complexity of the biological system.

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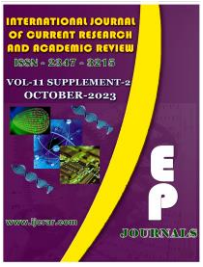

Full Length Article **IJCRAR/FL/44**

Production of Biochar from Saline Water Macroalgae, Cladophora glomerata and its Application on Improving Plant Growth

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Abstract

Marine macro algae Cladophora glomerata were collected from saline waters of Rameswaram coastal area. C. glomerata were unwashed, sundried and finely grained. The dried algal biomass characteristics of Carbon, Nitrogen, Hydrogen, Sulphur, Phosphorous, Potassium, Calcium, Magnesium and Sodium were estimated. The algal biomass was subjected to pyrolysis at the temperature range of 500 oC in the muffle furnace by semi-indirect heating method. The pyrolyzed biochar characteristics of were Carbon, Nitrogen, Hydrogen, Sulphur, Phosphorous, Potassium, Calcium, Magnesium and Sodium estimated. The biochar was used for the application by pot experiment. Two pots were taken and mentioned as control and Test (Biochar). Both the pots were examined for the plant growth every day for over a period of 10 days. The pots showed a significant difference, that the biochar applied pot had a positive effect on plant growth. The soil characters were estimated before the seedling process and at the end of 10 days incubation period. The soil nutrients were reduced as compared to before and after the plant growth can be related to the enhanced growth rates. The results showed that the pyrolytic biochar had a potential to be used in agricultural plant production, as an alternative for fertilizer and soil conditioners. The nutrients present in biochar are more suite for the plant growth. The study recommends the long-term field studies are needed rather than pot studies to understand the impact of biochar in soil.

Keywords: Biochar, Cladophora glomerata, pyrolysis of algae.

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International Journal of Current Research and Academic Review

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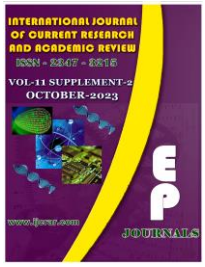

Introduction

Algal biomass is an area of intense research, development and commercialization. Lehmann (2007) and Powlson *et al.,* (2011) suggested that application of biochar in soil not only improve soil quality and nutrient leaching but also poses the greatest potential for the long-term sequestration of carbon (C). Biochar is an environmentally friendly alternative to activated carbon. Biochar is increasingly used in agriculture to improve the soil fertility, enhance crop productivity and to sequester C in soil and to reduce greenhouse gas emission. It increases the plant growth by improving the physiochemical and biological properties of soil and retain the fertility of soil by supplying mineral nutrients such as Ca, Mg, P, K, S etc.

Marine macro algae have attracted attention as a potential feedstock for renewable energy because of their short growth cycle, high productivity, high photosynthetic ability, efficient CO_2 fixation and less competition for food and farmland. They have rapid growth rates (Mata *et al.,* 2010) and ability to assimilate nutrients such as nitrogen and phosphorous (Neori *et al.,* 2003). C*ladophora species*, either they are marine or freshwater, are ecologically important macro algae. In summer, the filamentous green algae C*ladophora glomerata* dominate at the shallow sites in the semi-enclosed non-tidal low-saline sea and they build a mosaic of micro habitats on littoral rocky shores. In this study, we attempted pyrolysis of algae *C. glomerata* collected from saline waters and used it in enhancing soil fertility. The aim of the study was the production of biochar from saline water macro algae *C. glomerata* and study its application on improving plant growth and soil amendment.

Methodology

Collection of samples

Cladophora glomerata were collected from saline sea waters of Rameswaram coastal area.

Drying and grinding of algal sample

The collected *C. glomerata* were unwashed and subsequently sun dried until they fully dried. The dried algal sample were finely grained, characterized and subjected to pyrolysis.

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International Journal of Current Research and Academic Review

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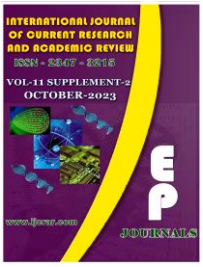

Production of biochar by pyrolysis

The dried algal biomass of *C. glomerata* was weighed and was kept in the crucible. Then the algal biomass was pyrolyzed in the muffle furnace at the temperature range of 500^{o} C by semi-indirect heating method. After the pyrolysis, the algal biochar was cooled and then collected.

Characterisation of the produced biochar

The Carbon (C), Nitrogen (N), Hydrogen (H), Sulphur (S), Phosphorous (P), Potassium (K), Calcium (C), Magnesium (Mg) and Sodium (Na) content of the produced biochar was determined as per the standard procedures as given in the above algal biomass and biochar characterization.

Application of biochar by pot experiment

For this pot experiment, the medium fertile soil sample was purchased from Ayapakkam. The two plastic pots were in the length is about 13cm and the breadth is about 12cm. The Navagra has seeds (Bengal gram, Wheat, Horse gram, green gram, Rice, White beans, Black sesame seeds, Chickpeas and Black gram), were chosen for their high protein content and the seeds were taken for the seedling process of about 50gms in each pot.

The pots were labelled and marked as control and Test (Biochar). In the control pot and the Test (Biochar) pot, the soil was filled about 500g in both the pots, then the soil was wetted for two days before the seedling process. In the Test (Biochar) pot, the algal biochar and soil was added and mixed in the ratio of 1:500 gms, then the seeds were sown and water was sprinkled. In the control pot, the seeds were sown and water was sprinkled. Both the control and Test (Biochar) pots were examined every day for over a period of 10 days.

Soil characterisation

The soil characters were determined before the seedling process and after the end of 10 days incubation period. The contents of the following parameters of Carbon, Nitrogen, Hydrogen, Sulphur, Phosphorus, Potassium, Calcium, Magnesium and Sodium were estimated by as per the standard procedure of the above algal biomass and biochar characterization.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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Results

Analysis of algal biomass characterisation

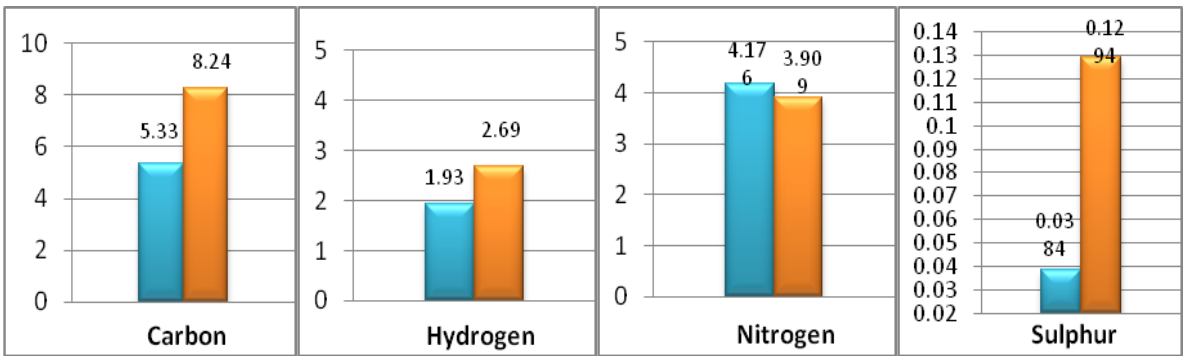
The physio-chemical characteristics of Carbon (C), Hydrogen (H), Nitrogen (N), Sulphur (S), Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg), and Sodium (Na) were analysed for the algal biomass of *C. glomerata* were shown in the below Graph -

Characterisation of the produced biochar

The physio-chemical characteristics of Carbon (C), Hydrogen (H), Nitrogen (N), Sulphur (S), Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg), and Sodium (Na) were analysed for the algal biochar of *C. glomerata* were shown in the below Graph. From the above results, the elemental composition of the algal biochar shows a significant difference when compared to the algal biomass. The concentrations of the elemental composition (C, H, S, P, K, Ca, Mg and Na) of algal biochar had comparatively higher than the algal biomass except for N. Nitrogen of algal biochar composition results in lower value when compared to algal biomass. The algal biochar contains a complete suite of micro and macro nutrients necessary to support the plant growth.

Graph.1 The Physio-Chemical Characteristics of C, H, N, S, P, K, Ca, Mg and Na for Algae and Biochar.

Graph.1(a) **Graph.1(b)** **Graph.1(c)** **Graph.1(d)**



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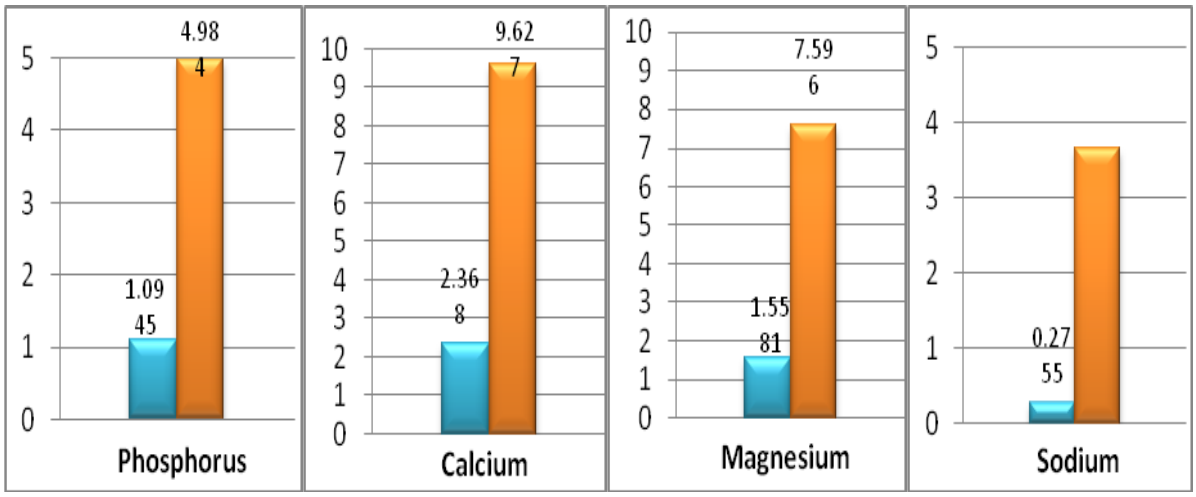
Graph.1(e) **Graph.1(f)** **Graph.1(g)** **Graph.1(h)**



Application of biochar by pot experiment

The results of both control and Test (Biochar) were observed for the period of 10 days. The influence of biochar on the growth of the seeds was monitored every day. The results of pot experiment which were shown in the given from Fig1-Fig10.

Fig.1 **Fig.2** **Fig.3** **Fig.4** **Fig.5**

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International Journal of Current Research and Academic Review

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Fig.6 **Fig.7** **Fig.8** **Fig.9** **Fig.10**

Discussion

Biochar influences nutrients in soil in several ways by acting as a source of nutrients for plants and soil microorganisms and alter the properties of the soil. In the current study the effect of pyrolysis temperature on the product yield of *Cladophora glomerata* was observed to be significant. Biochar is generally carbon rich material that when applied to soil increases soil C sequestration. The primary components of biochar in the present study from *C. glomerata* also had a higher carbon content after pyrolysis at 500 ^{o}C. Carbon content of algae was 5.33 gms and the carbon content of biochar was 8.24 gms. Generally N content is low in most biomasses, the N content is mostly increased after pyrolysis due to reducing the mass (mainly the moisture) of the biomass. The present study reports a reduction in Nitrogen content after pyrolysis from 4.176 gms to 3.909 gms. Earlier researchers Al-Wabel *et al.,* 2013; Leng *et al.,* 2020 reported a reduction in N content and suggested the loss of N may be due to gaseous emission during pyrolysis. The P content in the current study increased from 1.0945gm to 4.984 gms. Li *et al.,* 2020 observed that the amount of P increased with increase in pyrolytic temperature to 600 °C. The K content in the current study increased from 0.9933gm to 2.445 gms. The K content in biochar also increases, besides the C and P the concentration of other nutrients like Ca, Mg, Na and S also increased after pyrolysis to significant levels.

The effect of biochar on plant growth was also studied. The positive effect of biochar on growth of the plant was observed. The plants showed significant increase in height in the biochar treated soil pot. The soil properties of biochar untreated soil and the biochar treated soil properties were compared after ten dates of plant growth. A decrease in soil nutrients content was observed in the biochar treated soil. The current study observed changes in soil properties resulting from biochar

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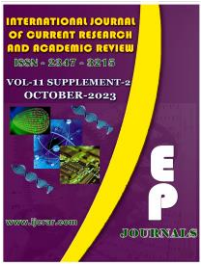

application resulting in the uptake and assimilation of nutrients and enhanced crop growth and development. Addition of biochar had enhanced the mobilization of carbon following biochar application from 6.8984 gms to 6.043 gms allowing plants to uptake more carbon when compared to the control. The N content in pot 2 decreased from 2.343 gms to 2.293 gms. Biochar has proven to alter P availability in soils by reducing P leaching. K in the soil from 56.4 mg to 44.95 mg, an enhanced Ca uptake after addition of biochar from 423.7 mg to 373.82 mg. An increase in Mg level from 356.4 mg to 545.35 mg was found in the current study. Biochar amendment provided an enhanced uptake of S from 6.64 mg to 4.59 mg. There was significant reduction in all the nutrient levels which can be related to the enhanced growth rates. But the study recommends long-term field studies are needed rather than pot studies to understand the impact of biochar in soil.

Conclusion

The present study was a preliminary effort to produce a biochar and study its characteristics. In the study we observed biochar application had a positive effect on plant growth. Under the pyrolysis conditions employed in the study at 500^{o} C there was an increase in the minerals compared to the raw unpyrolyzed feed stock. By being rich in minerals important for plant growth, biochar may be better suited as an alternative for fertilizers. Methods to increase the N content of biochar should be attempted for example by adjusting the pyrolytic conditions, because N was reduced at 500^{o} C, the pyrolysis temperature used in the study. In spite of the increased growth observed it is recommended for field studies to understand the real impact of biochar in soil.

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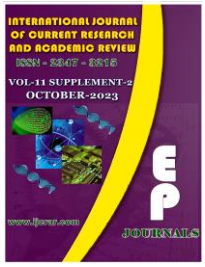

Full Length Article **IJCRAR/FL/45**

Unlocking Autism's Enigma: Harnessing the Power of Machine Learning for Early Detection and Intervention

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Abstract

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition characterized by a wide range of symptoms and severity levels. Early diagnosis and intervention are crucial for improving the outcomes of individuals with ASD. Machine learning (ML) has emerged as a promising tool in the field of autism detection, offering the potential to enhance early diagnosis and aid in personalized treatment planning. This research paper provides an overview of the current state of machine learning applications in autism detection, discusses the challenges and limitations, and explores future directions for research and clinical implementation.

Keywords: neurodevelopmental condition, social communication, behavior, and sensory processing.

Introduction

Autism Spectrum Disorder (ASD) is a heterogeneous neurodevelopmental condition that affects social communication, behavior, and sensory processing. It is estimated that approximately 1 in

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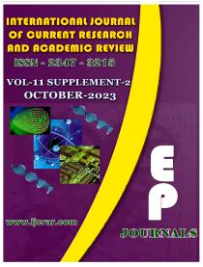

54 children in the United States is diagnosed with ASD, making it a significant public health concern [1]. Early diagnosis and intervention are crucial for improving the long-term outcomes of individuals with ASD [2]. However, the diagnosis of ASD can be challenging due to its heterogeneity and the complexity of its clinical presentation.

Machine learning, a subfield of artificial intelligence, has shown great promise in assisting with the early detection and diagnosis of ASD. ML algorithms can analyze large datasets of clinical, behavioral, and neuroimaging data to identify patterns and biomarkers associated with ASD. This paper reviews the current state of machine learning applications in autism detection, explores the challenges and limitations, and discusses potential future directions.

Machine Learning Approaches in Autism Detection

Behavioral Data Analysis

Machine learning algorithms can analyze behavioral data, such as video recordings of social interactions, to identify early signs of ASD. Natural language processing (NLP) techniques have been used to analyze speech and language patterns in children, identifying linguistic features associated with ASD [3]. Similarly, computer vision algorithms can analyze facial expressions and body movements to detect social and emotional differences [4]. Behavioral data analysis of autism using machine learning involves using computational techniques to analyze and interpret various behavioral patterns and data associated with individuals on the autism spectrum. Autism is a complex neurodevelopmental disorder characterized by a wide range of behavioral traits, and machine learning can help researchers and clinicians better understand, diagnose, and support individuals with autism. Here's an overview of how this process works:

Data Collection

The first step is to collect a diverse range of behavioral data from individuals with autism. This data can include information from clinical assessments, surveys, observational notes, videos of social interactions, sensor data (e.g., eye-tracking, EEG), and more. The data may capture various aspects of behavior, communication, social interaction, and sensory sensitivities.

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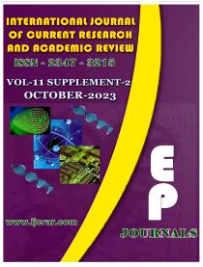

Data Preprocessing

Raw behavioral data often needs preprocessing to make it suitable for machine learning. This step involves cleaning, normalizing, and transforming the data. Missing values may be imputed, and noisy data may be filtered or smoothed.

Feature Extraction

Features or variables relevant to autism-related behaviors are extracted from the preprocessed data. These features could include measures of eye gaze patterns, speech characteristics, facial expressions, gesture movements, and more. The choice of features depends on the specific research question or application.

Data Labeling

In supervised learning scenarios, it's essential to label the data to indicate whether each instance belongs to an autistic or neurotypical individual. Diagnostic criteria, clinical assessments, or expert evaluations can be used for labeling.

Model Selection

Researchers choose a machine learning model that is appropriate for the task at hand. Common choices include decision trees, support vector machines, neural networks, and more advanced techniques like deep learning. The choice of the model depends on the nature of the data and the specific research objectives.

Training the Model

The selected model is trained using the labeled behavioral data. During training, the model learns to recognize patterns and relationships between the extracted features and the diagnosis or specific behavioral outcomes of interest.

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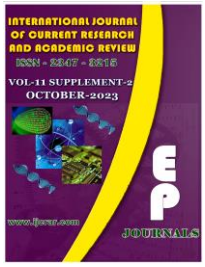

Model Evaluation

To assess the model's performance, it is tested on a separate dataset that it has not seen during training. Various evaluation metrics, such as accuracy, precision, recall, F1-score, and ROC curves, can be used to measure the model's effectiveness in predicting autism-related behaviors.

Interpretability

Interpretability is crucial in the context of autism research. Researchers and clinicians need to understand why the model makes specific predictions. Techniques such as feature importance analysis, SHAP values, and attention mechanisms can provide insights into which features are most relevant for making predictions.

Clinical Applications

Once the machine learning model is trained and validated, it can be applied to real-world scenarios. For example, it can aid in the early detection of autism, provide insights into the effectiveness of interventions, or help tailor treatment plans for individuals with autism.

Behavioral data analysis of autism using machine learning is a powerful tool for gaining a deeper understanding of the disorder and improving diagnostic accuracy and personalized care for individuals on the autism spectrum. However, it's essential to ensure data privacy and ethical considerations are addressed when working with sensitive behavioral data.

Neuroimaging Biomarkers

Functional and structural neuroimaging data have also been utilized in ML models for autism detection. Functional MRI (fMRI) and diffusion tensor imaging (DTI) data can reveal aberrant brain connectivity patterns and structural abnormalities associated with ASD [5]. ML algorithms can extract relevant features from these data modalities and differentiate individuals with ASD from typically developing peers. Neuroimaging biomarkers in autism detection refer to specific patterns or features identified in brain imaging data (e.g., MRI or fMRI scans) that can be

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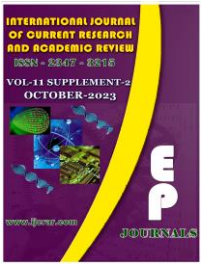

indicative of autism spectrum disorder (ASD). Machine learning techniques are used to analyze these biomarkers and improve autism diagnosis. Machine learning algorithms can learn from large datasets of neuroimaging data, allowing them to detect subtle patterns or differences in brain structure and function associated with ASD. By identifying these biomarkers, machine learning models can help enhance the accuracy and efficiency of autism detection, potentially aiding in early diagnosis and intervention for individuals with ASD.

Genetic and Molecular Data

Genomic data can provide insights into the genetic basis of ASD. ML models can analyze genetic and molecular data to identify potential risk factors and biomarkers associated with ASD susceptibility [6]. This approach holds promise for understanding the genetic underpinnings of ASD and developing targeted treatments.

Genetic and molecular data in autism detection involve analyzing an individual's genetic makeup and molecular characteristics to identify patterns or markers associated with autism spectrum disorder (ASD) using machine learning. Researchers use techniques like DNA sequencing and gene expression profiling to gather this data. Machine learning models can then be trained on these datasets to discover genetic variations or molecular signatures that are more prevalent in individuals with ASD. By leveraging machine learning, it's possible to improve our understanding of the genetic and molecular underpinnings of ASD, potentially aiding in early diagnosis and personalized treatment strategies for affected individuals.

Challenges and Limitations

While machine learning has shown significant promise in autism detection, several challenges and limitations need to be addressed:

Data Quality and Quantity

High-quality, large-scale datasets are crucial for training accurate ML models. However, obtaining such datasets, especially for rare subtypes of ASD or specific age groups, can be

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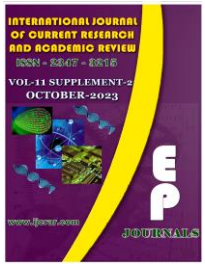

challenging. Data quality issues, such as missing data and data variability, can also impact model performance.

Generalization

ML models trained on one dataset may not generalize well to diverse populations or different clinical settings. Ensuring the robustness and generalizability of models across various demographic groups and clinical contexts is essential.

Interpretability

The "black-box" nature of some ML algorithms can make it challenging to interpret their decision-making processes. Clinicians and researchers need transparent models that provide insights into why a particular classification or prediction was made.

Ethical and Privacy Concerns

The use of sensitive health data in ML applications raises ethical and privacy concerns. Protecting individuals' data and ensuring that algorithms do not reinforce biases are critical considerations in autism detection research.

Future Directions

Multimodal Integration

Integrating multiple data modalities, such as behavioral, neuroimaging, and genetic data, holds promise for improving the accuracy of autism detection models. Combining these sources of information can provide a more comprehensive understanding of ASD.

Explainable AI (XAI)

Developing explainable AI techniques that provide interpretable insights into model predictions is crucial for gaining trust among clinicians and researchers. Explainable AI can also help uncover novel biomarkers and mechanisms underlying ASD.

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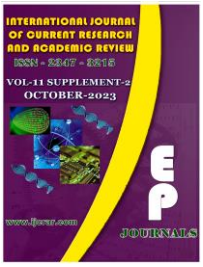

Cross-Cultural Validation

Validating ML models across diverse cultural and linguistic contexts is essential to ensure their applicability worldwide. Collaboration among researchers from different regions can facilitate the development of globally applicable models.

Longitudinal Studies

Longitudinal studies tracking individuals from infancy to adulthood can provide valuable insights into the developmental trajectories of ASD. ML models that can predict future outcomes and treatment responses based on early data could revolutionize personalized intervention strategies.

Conclusion

Machine learning has the potential to significantly enhance the early detection and diagnosis of Autism Spectrum Disorder. By analyzing diverse data sources and developing transparent, interpretable models, ML can aid clinicians in making more accurate diagnoses and inform personalized treatment plans. However, addressing challenges related to data quality, generalization, interpretability, and ethical considerations is essential for the responsible application of ML in autism detection. Collaborative efforts among researchers, clinicians, and policymakers are crucial to harness the full potential of machine learning in improving the lives of individuals with ASD.

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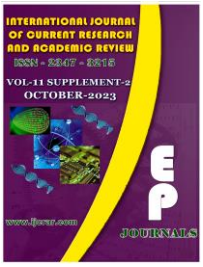

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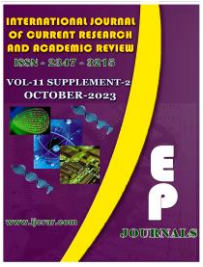

Full Length Article **IJCRAR/FL/46**

Comparative Study on Types of Segmentation and its Applications Using Deep Learning

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Abstract

Image segmentation plays an important role in a pre-processing phase of images having as objective a partition of the image into components or regions of interest for a more detailed analysis of one or more of these regions. Image segmentation may also be used as a pre-processing phase for a better image de-noising or de-blurring that will be done in a separate image processing phase. In this paper, an in-depth analysis is carried out on some frequently adopted image segmentation techniques such as thresholding based techniques, edge detection based, region-based techniques, clustering etc. and also discuss their advantages and disadvantages. This comparison study is useful for increasing accuracy and performance of segmentation methods in various image processing domains. Deep Learning is an emerging technology which evolves in machine learning. Deep learning concept is inbuilt with many algorithms which help to train the input data set into different layer of perceptron.

Keywords: Segmentation, Threshold Segmentation, Edge based Segmentation, Watershed based Segmentation.

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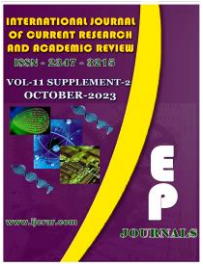

Introduction

Image segmentation is a branch of digital image processing which mainly focuses on partitioning an image into different parts based on their features, characteristics and properties. The primary goal of image segmentation is to simplify the image for easier analysis.

Image segmentation is a large aspect of computer vision and has many applications in numerous industries. In image segmentation, we divide an image into various parts that have similar attributes. The parts in which you divide the image are called image object or image regions. Image segmentation is used in numerous applications in the field of analysis of images, augmented reality, machine vision, and many more.

The goal of segmentation is to simplify or change the representation of an image which helps to analyze easily. It is used in various applications such as object recognition, tracking, and detection, robotics, face Recognition, Number Plate Identification, Image Based Search and Medical Imaging.

Image Segmentation

Image segmentation is the process of dividing an image into multiple meaningful and homogeneous regions or objects based on their inherent characteristics based on color, intensity, texture, shape, or brightness.

Each pixel is labelled and all the pixels belonging to the same category have a common label assigned to them. The task of segmentation can be classified by two ways 1. Discontinuity – where the segments are formed based on the change of pixel intensity values within the image.

This strategy is used by line, point, and edge detection techniques to obtain intermediate segmentation results that may be processed to obtain final segmented image. 2. Similarity -The segments are formed by detecting similarity between image pixels. Machine learning algorithms such as clustering are based on this type of approach for image segmentation.

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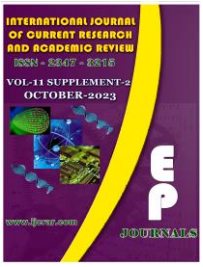

Types of Segmentation

Image segmentation modes are divided into three categories based on the amount and type of information that should be extracted from the image: Instance, semantic, and panoptic. It would be easy to distinguish object and background. Objects are the identifiable entities in an image that can be distinguished from each other by assigning unique IDs, while the background refers to parts of the image that cannot be counted. By distinguishing between objects and backgrounds, it becomes easier to understand the different modes of image segmentation and their respective applications.

Instance Segmentation

It is a type of image segmentation that involves segmenting and detecting each object in an image. It is similar to object detection but with the added task of segmenting the object's boundaries. The algorithm has no idea of the class of the region, but it separates overlapping objects. Instance segmentation is useful in applications where individual objects need to be identified and tracked.

Semantic Segmentation

It is a type of image segmentation that involves labelling each pixel in an image with a corresponding class label with no other information or context taken into consideration. The goal is to assign a label to every pixel in the image, which provides a dense labeling of the image. The algorithm takes an image as input and generates a segmentation map where the pixel value ranges from 0 to 255. The image is transformed into class labels (0,1,...n). It is useful in applications to identify the different classes of objects.

Panoptic Segmentation

It is a combination of semantic and instance segmentation. It involves labeling each pixel with a class label and identifying each object instance in the image. This mode of image segmentation provides the maximum amount of high-quality granular information from machine learning algorithms. It is useful in applications where the computer vision model needs to detect and interact with different objects in its environment, like an autonomous robot.

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International Journal of Current Research and Academic Review

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Fig.1 a. Original image b.Semantic Segmentation c.Instance Segmentation d.Panoptic Segmentation

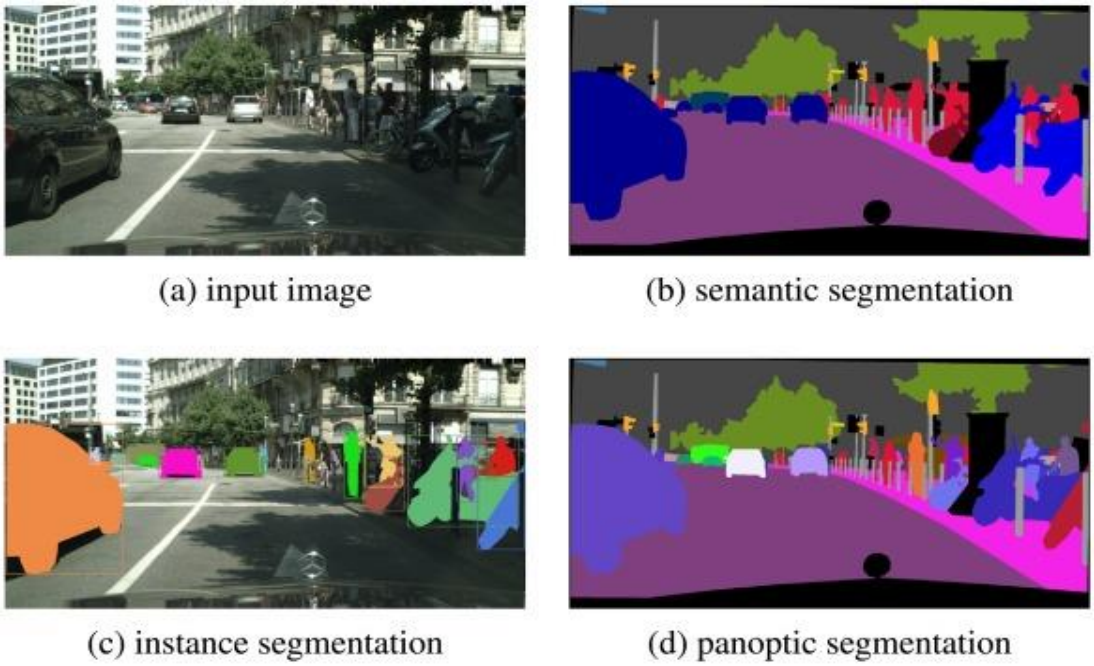

Image Segmentation Techniques

Image Segmentation has been classified on different kinds based on the approaches and kinds of techniques. These techniques help us to understand their properties, benefits, and limitations.

- Thresholding Segmentation
- Edge-Based Segmentation
- Region-Based Segmentation
- Watershed Segmentation
- Clustering-Based Segmentation Algorithms
- Neural Networks for Segmentation

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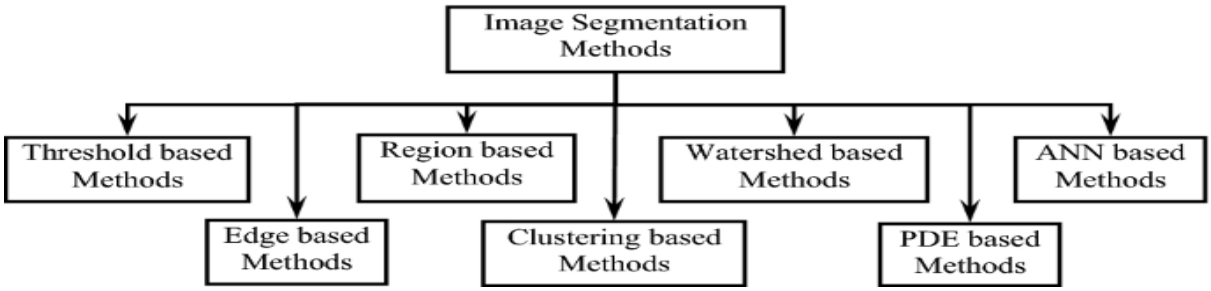
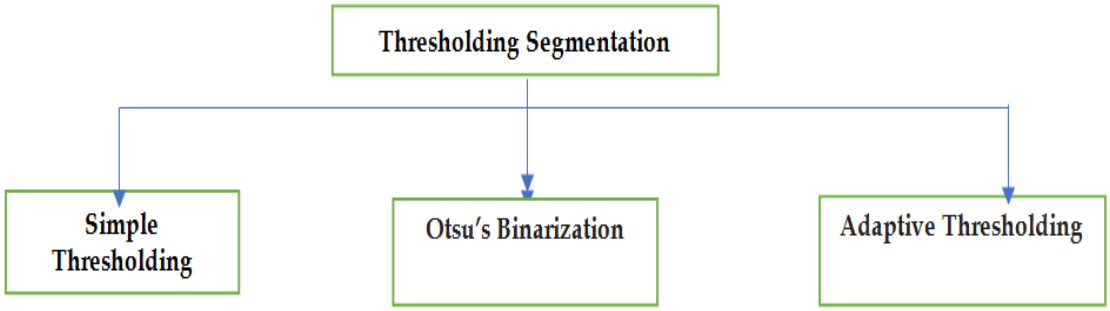
Fig.2 Types of Segmentation Techniques



Threshold Based Segmentation

It is the simplest method of segmentation in image processing. It divides the pixels in an image by comparing the pixel's intensity with a specified value. It is useful when the required object has a higher intensity than the background i.e. unnecessary parts. We can consider the threshold value (T) to be a constant but it would only work if the image has very little noise with unnecessary information and data. The threshold value may be constant or dynamic based on the requirements. The thresholding method converts a grey-scale image into a binary image by dividing it into two segments (required and not required sections). We can classify thresholding segmentation based on the following categories:

Fig.3 Threshold Segmentation



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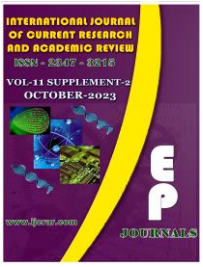

Simple Thresholding

This is simple thresholding and is particularly suitable for beginners in image segmentation. The image's pixels are replaced with either white or black. If the intensity of a pixel at a particular position is less than the threshold value, it is replaced with black and if it's higher than the threshold, it is replaced with white.

Otsu's Binarization

Simple Threshold is the simplest, straightforward and efficient method since we use a constant threshold value to perform image segmentation. We consider the image with a histogram having two peaks, one for the foreground and one for the background in simple threshold, whereas in Otsu binarization, we have to consider the bimodal image and middle of the peaks for calculating the threshold value. This process is quite popular for scanning documents, recognizing patterns, and removing unnecessary colours from a file.

Adaptive Thresholding

In the above methods we have to consider constant threshold value which might not be suitable for every image. Different images have different backgrounds and condition which affect their properties. Instead of using a constant value for performing segmentation, we use different threshold values for different sections of an image. This method works well with images that have varying lighting conditions.

Edge-Based Segmentation

Edge-based segmentation is one of the most popular implementations of segmentation in image processing. It helps to focus on identifying the edges of different objects in an image. Edge detection is widely popular because it helps to remove unwanted and unnecessary information from the image. It reduces the image's size considerably, making it easier to analyze the same. Algorithms used in edge-based segmentation helps to identify edges in an image based on texture, contrast, grey level, colour, saturation, and other properties. It helps to improve the

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quality of your results by connecting all the edges into edge chains that match the image borders more accurately. They are classified into 2 types.

Search-Based Edge Detection

Search-based edge detection methods focus on computing a measure of edge strength and for local directional maxima of the gradient magnitude through a computed estimate of the edge's local orientation.

Zero-Crossing Based Edge Detection

Zero-crossing based edge detection methods look for zero crossings in a derivative expression retrieved from the image to find the edges. In this method we have to preprocess the image to remove unwanted noise and make it easier to detect edges. Canny, Prewitt, Deriche, and Roberts cross are some of the most popular edge detection operators. They make it easier to detect discontinuities and find the edges.

Roberts Edge Detection Method

It performs a simple, quick to compute, 2-D spatial gradient measurement on an image. This method emphasizes regions of high spatial frequency which often correspond to edges. The input to the operator is a grayscale image the same as to the output is the most common usage for this technique. Pixel values in every point in the output represent the estimated complete magnitude of the spatial gradient of the input image at that point.

Fig.4 Roberts Edge Detection

-1	0
0	+1

G_x

0	-1
+1	0

G_y

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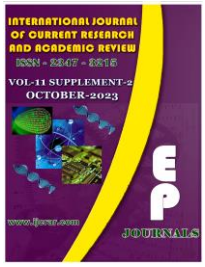

Sobel Edge Detection Method

The Sobel method of edge detection for image segmentation finds edges using the Sobel approximation to the derivative. It precedes the edges at those points where the gradient is highest. The Sobel technique performs a 2-D spatial gradient quantity on an image and so highlights regions of high spatial frequency that correspond to edges. It is used to find the estimated absolute gradient magnitude at each point in input grayscale image. This is similar to the Roberts Cross operator.

Prewitt Edge Detection Method

It is used to estimate the magnitude and orientation of an edge. It is used to estimate the direction from the magnitudes in the xand y-directions and time-consuming calculation.

Fig.5 Prewitt Edge Detection

-1	-2	-1
0	0	0
+1	+2	+1

G_x

-1	0	-1
-2	0	+2
-1	0	+1

G_y

Canny Edge Detection Method

Canny Edge detection technique is one of the standard edge detection techniques to find edges by separating noise from the image before finding the edges of the images. Canny method is the best method without disturbing the features of the edges of the image, find the edges and serious value for threshold.

Region Based Segmentation

Region-based segmentation algorithms divide the image into sections with similar features. These regions are only a group of pixels and the algorithm are used to find the groups by first locating a seed point which could be a small section or a large portion of the input image. After finding the

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seed points, a region-based segmentation algorithm would either add more pixels to them or shrink them so it can merge them with other seed points. Region-based segmentation are classified into 2 types Region Growing and Region Splitting and merging.

Region Growing

In this method, we start with a small set of pixels and then start iteratively merging more pixels according to particular similarity conditions. A region growing algorithm pick an arbitrary seed pixel in the image, compare it with the neighboring pixels and start increasing the region by finding matches to the seed point.

When a particular region cannot grow further, the algorithm will pick another seed pixel which might not belong to any existing region. One region can have too many attributes causing it to take over most of the image. To avoid such an error, region growing algorithms grow multiple regions at the same time. We use region growing algorithms for images that have a lot of noise as the noise would make it difficult to find edges or use thresholding algorithms.

Region Splitting and Merging

Region splitting and merging focus on two actions together – splitting and merging portions of the image. The images having similar attributes are considered. They merge the adjacent portions which are similar to one another. In region splitting, the algorithm considers the entire image while in region growth, the algorithm would focus on a particular point.

The region splitting and merging method follows a divide and conquer methodology. It divides the image into different portions and then matches them according to its predetermined conditions. Another name for the algorithms that perform this task is split-merge algorithms.

Clustering-Based Segmentation Algorithm

They are unsupervised algorithms which helps to find the hidden data in the image that might not be visible to a normal vision. This hidden data includes information such as clusters,

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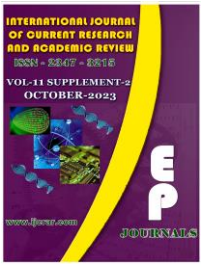

structures, shadings, etc. Clustering algorithm divides the image into clusters of pixels that have similar features. It would separate the data elements into clusters where the elements in a cluster are more similar in comparison to the elements present in other clusters. Some of the popular clustering algorithms include fuzzy c-means (FCM), k-means, and improved k-means algorithms.

K-means Clustering

K-means is a simple unsupervised machine learning algorithm. It classifies an image through a specific number of clusters. It starts the process by dividing the image space into k pixels that represent k group centroids. Then they assign each object to the group based on the distance between them and the centroid. When the algorithm has assigned all pixels to all the clusters, it can move and reassign the centroids.

Fuzzy C Means

Fuzzy c-means clustering is a method, where the pixels in the image can get clustered in multiple clusters. This means a pixel can belong to more than one cluster. However, every pixel would have varying levels of similarities with every cluster. The fuzzy c-means algorithm has an optimization function which affects the accuracy of the results.

Water -Based Segmentation Algorithm

Watershed algorithm is used for segmentation in some complex images. Watershed algorithm is based on extracting background and foreground and then using markers will make watershed run and detect the exact boundaries. This algorithm generally helps in detecting touching and overlapping objects in image.

Watershed is a transformation on a grayscale image. For markers, it can be user defined like manually clicking and getting the coordinates for markers and also using some defined algorithms such as thresholding or any morphological operations. We cannot apply watershed algorithms directly, due to the presence of noise.

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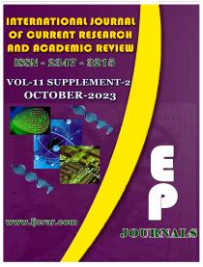

PDE Based Segmentation

Partial differential equation (PDE) method shows better performance than traditional image processing methods, and some new ideas have never been considered in traditional image processing, such as affine invariant feature extraction, image structure and texture decomposition, etc.

ANN Based Segmentation

The approach of using Image Segmentation using neural networks is often referred to as Image Recognition. Convolutional Neural Networks are specifically used for this process because of their design to identify and process high-definition image data. An image, based on the approach used, is considered either as a set of vectors (color annotated polygons) or a raster (a table of pixels with numerical values for colors).

The vector or raster is turned into simpler components that represent the constituent physical objects and features in an image. These algorithms are widely used in a variety of industries and applications. E-commerce industry uses it for providing relevant products to users for their search requirements and browsing history.

The manufacturing industry uses it for anomaly detection, detecting damaged objects, ensuring worker safety etc. Image Recognition is famously used in education and training for visually impaired, speech impaired students. Although Neural Nets are time consuming when it comes to training the data, the end results have been very promising and the application of these has been highly successful.

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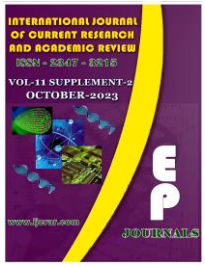

Comparison of Segmentation Methods with Advantage and Limitations

Table.1 Comparison of Segmentation Methods

S. No	Methods	Advantage	Limitations
1	Threshold Based Segmentation	1.Simplest Method 2. It divides the pixels in an image by comparing the pixel's intensity with a specified value. 3 It is useful when the required object has a higher intensity than the background	1.They consider only the intensity, not any relationships between the pixels. 2.There is no guarantee that the pixels identified by the thresholding process are contiguous.
2	Edge Based Segmentation	1.It helps to focus on identifying the edges of different objects in an image. 2.It helps to remove unwanted and unnecessary information from the image. 3. It reduces the image's size and helps to identify edges in an image based on texture, contrast, grey level, color, saturation, and other properties	1.They do not produce many accurate segmentation results when there are no significant differences between pixel values of the object and the background.
3	Region Based Segmentation	1.It divide the image into sections with similar feature with the help of seed point 2. It would either add more pixels to them or shrink them so it can merge them with other seed points.	1.The main challenges of region growing are choosing the appropriate seeds, defining the similarity measure, and controlling the region size and shape.
4	Clustering Based Segmentation	1.It helps to find the hidden data such as clusters, structures, shadings, etc. in the image that might not be visible to a normal vision.	1.It is complex and inability to recover from database corruption.
5	Water Based Segmentation	1. Watershed algorithm is based on extracting background and foreground and	1. It is highly sensitive to local minima, since at each

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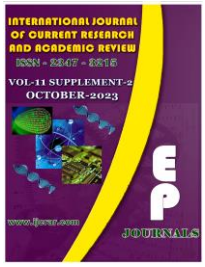

S. No	Methods	Advantage	Limitations
		then using markers will make watershed run and detect the exact boundaries	minimum, a watershed is created. 2.The image with noise will influence the segmentation.
6	PDE Based Segmentation	1.It is used for affine invariant feature extraction, image structure and texture decomposition.	1. It reduce the effects of noise on both the gradient and the region information.
7	ANN Based Segmentation	1.It is used design to identify and process high-definition image data.	1.ANNs do not scale well with size of input image.

Application of Segmentation

Medical Imaging

Image segmentation is widely used in medical imaging for tasks such as tumor detection, organ segmentation, and disease diagnosis. Accurate segmentation is essential for treatment planning and monitoring disease progression.

Robotics

Image segmentation is used in robotics for object recognition and manipulation.. For example, robots can use segmentation to recognize and grasp specific objects, such as tools or parts, in industrial settings.

Surveillance

Image segmentation is used in surveillance for detecting and tracking objects and people in real-time video streams. Segmentation can help to identify and classify objects of interest, such as suspicious behavior or potential threats.

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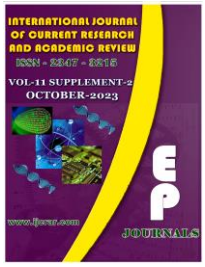

Agriculture

Image segmentation is used in agriculture for crop monitoring, disease detection, and yield prediction. Accurate segmentation can help farmers make informed decisions about crop management and optimize crop yields.

Autonomous vehicle

Image segmentation is essential for the development of autonomous vehicles, allowing them to detect and classify objects in their environment, such as other vehicles, pedestrians, and obstacles. Accurate segmentation is crucial for safe and reliable autonomous navigation.

Conclusion

In this paper, detail and comparative study on types segmentation techniques is evaluated. From the study, this can be concluded that Image segmentation is used to extract the object in image and the techniques of segmentation depend on various features of image such as color, intensity values, texture, contents, pixels, similarities etc. It is a challenging image process in future and used in many real-life applications. Image segmentation continues to advance, future directions will focus on improving segmentation accuracy, integrating deep learning with traditional techniques, and exploring new applications in various fields. Auto-segmentation with the Segment Anything Model (SAM) is a promising direction that can reduce manual intervention and improve accuracy. Integration of deep learning with traditional techniques can also help to overcome the limitations of individual techniques and improve overall performance. With ongoing research and development, we can expect image segmentation to continue to make significant contributions to various fields and industries

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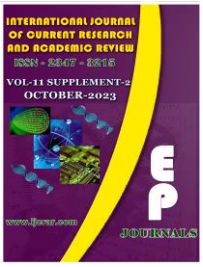

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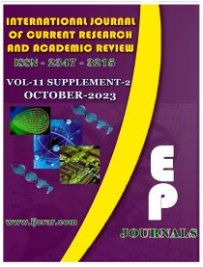

Full Length Article **IJCRAR/FL/47**

Data Mining Using BI

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Abstract

Data mining helps companies gather reliable information. It's an efficient, cost-effective solution compared to other data applications. It helps businesses make profitable production and operational adjustments. While these terms are often used interchangeably, they have distinct meanings and purposes. Data Mining focuses on uncovering hidden patterns and relationships within data, while Business Intelligence emphasizes analysing and presenting data to drive business insights.

Keywords: Business Intelligence Applications, data science, artificial intelligence, machines.

Introduction

Data is the new gold. But only when it's mined, extracted, and transformed, it becomes valuable. Data is the most powerful weapon in today's world. With technological advancement in the field of data science and artificial intelligence, machines are now empowered to make decisions for a firm and benefit them. The method of extracting useful information to identify patterns and trends in the form of useful data that allows businesses and huge firms to analyze and make decisions from huge sets of data is called Data Mining. We categorize them into useful data, which is collected and stored in particular areas such as data warehouses, efficient analysis, and data mining algorithms, which help their decision-making and other data requirements which

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benefits them in cost-cutting and generating revenue. This technique helps businesses and firms to analyze valuable user data to their benefit.

Data Mining for Business Intelligence Applications

Data mining is a critical component of business intelligence (BI). Once all the valuable information has been extracted from the data, businesses turn it into actionable knowledge – in other words, business intelligence. This knowledge helps organizations make data-driven decisions not only to improve operations, increase revenue, and drive growth, but also to reduce risks and detect fraud, errors, and inconsistencies that can potentially lead to profit loss and reputation damage. Different industries use data mining in different contexts, but the goal is the same: to better understand customers and the business.

Data Mining Tools

These are some data mining tools that are helpful for us to analyze the data.

- Orange
- Rapid Miner
- Weka
- Sisense
- SSDT

Table.1 Difference Between Business Intelligence and Data Mining

BUSINESS INTELLIGENCE	DATA MINING
Business intelligence (BI) refers to a technology-driven process that transforms the data into actionable information. Organizations have a huge flow of data coming from their customer end.	The term data mining itself explains its meaning, and it is the mining of important information, patterns, and trends.

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

The data-driven decisions help in decision-making purposes in the organization.	It finds the answer to a problem in the business.
It has a large dataset processed on relational databases.	It has small data sets processed on a small portion of data.
It represents results on dashboards and reports by charts and graphs with KPI's	It identifies the solution for a problem to be represented as one of the KPI's in dashboards or reports.
It depends on a small scale of past data, and there is no intelligence involved; business management has to decide based on the information.	It focused on a specific problem in business management on small-scale data using various algorithms to determine the solution.

Data Mining in Various Field

Fig.1 Detecting Phishing website

In recent times, technological advancement created a way for the development of e-commerce sites and most of the users started shopping online for which they have to provide their sensitive information like bank details, username, password, etc. Fraudsters and cybercriminals use this opportunity and create fake sites that look similar to the original to collect sensitive user data. In this data mining project, you will develop an algorithm to detect phishing sites based on the characteristics like security and encryption criteria, URL, domain identity, etc.

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

House price prediction

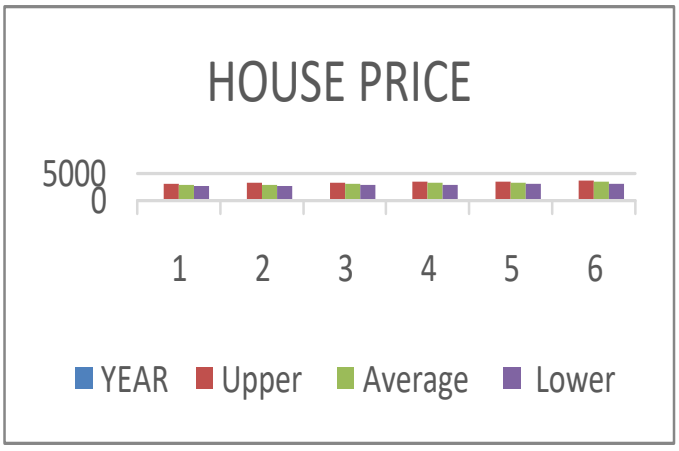
In this data mining project, you will utilize data science techniques like machine learning to predict the house price at a particular location. This project finds applications in real estate industries to predict house prices based on previous data. Data can be the location and size of the house and facilities near the house.

The following table consists of values of rates from the year 2010 to 2015. Each year is represented as square feet values in the table.

Table.2

Year	Upper	Average	Lower
1	3187	2890	2677
2	3230	2975	2805
3	3315	3060	2890
4	3442	3230	3017
5	3612	3315	3060
6	3740	3442	3187

Fig.2



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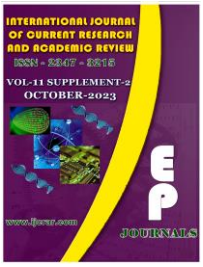

Heart Disease Prediction

Heart disease is one of the most common diseases. It needs a lot of care from the doctor to get diagnosed. In this data mining project, you will learn to develop a system to detect whether the patient is suffering from heart disease or not.

Real Life Applications of Data Mining

Financial Analysis

The banking and finance industry relies on high-quality and processed, reliable data. In the finance industry user, data can be used for a variety of purposes, like portfolio management, predicting loan payments, and determining credit ratings.

Telecommunication Industry

With the advent of the internet the telecommunication industry is expanding and growing at a fast pace. Data mining can help important industry players to improve their service quality to compete with other businesses.

Intrusion Detection

Network resources can face threats and actions of cybercriminals can intrude on their confidentiality. Therefore, the detection of intrusion has proved as a crucial data mining practice. It enables association and correlation analysis, aggregation techniques, visualization, and query tools, which can efficiently detect any anomalies or deviations from normal behavior.

Retail Industry

The established retail business owner maintains sizable quantities of data points covering sales, purchasing history, delivery of goods, consumption, and customer service. Database management has improved with the arrival of e-commerce marketplaces and emerging new technologies.

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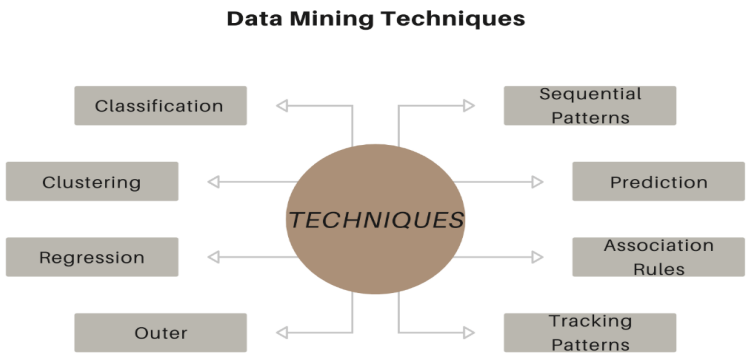
Data Mining Techniques

There are many data mining techniques that businesses use to analyse their data. Some of the common ones are:

Fig.3



Classification: Categorizes data into predefined groups based on specific criteria.

Clustering: Groups similar data points together based on their similarity.
Regression Analysis: Predicts the value of one variable based on another variable.

Association Rules: Identifies relationships between different variables in large datasets.

Sequence Mining: Identifies patterns and sequences in data that occur frequently.

Text Mining: Extracts relevant information and patterns from unstructured text data.

Anomaly Detection: Identifies unusual patterns or outliers in data that deviate from expected norms.

Dimensionality Reduction: Reduces the number of variables in a dataset while retaining key information.

EXCELLENT PUBLISHERS

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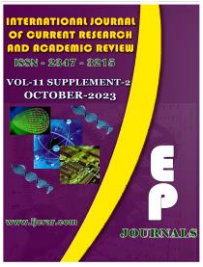

Conclusion

Data mining is a composite discipline that can represent a variety of methods or techniques used in different analytic methods that helps firms and organizations to make efficient business decisions and benefit them. Data mining is used in diverse applications such as banking, marketing, healthcare, telecom industries, and many other areas. Data mining techniques help companies to gain knowledgeable information, increase their profitability by making adjustments in processes and operations. It is a fast process which helps business in decision making through analysis of hidden patterns and trends.

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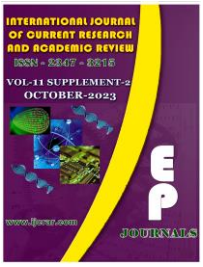

Full Length Article **IJCRAR/FL/48**

A Study on Waiting Lines and Queuing System in Banks

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Abstract

Queuing is the process of moving customers in a specific sequence to a specific service according to the customer need. Waiting lines and service efficiency are the important elements for any system. This paper deals with the analysis of waiting lines and queuing system in banks in India. The data for the study was collected by observation in which number of customers arriving at the service window was recorded. Data were fitted into the model and the results were computed. The analysis of the results shows that the numbers of existing service windows are not adequate for the customer's service. In order to serve the customer better and reduce the waiting lines in the system, the number of service windows should be increased.

Keywords: Arrival Rate, Service Rate, Service Unit, Servers, Performance measures.

Introduction

Queues or waiting lines are very common in everyday life whereby certain business situations require customers need to wait in a line for a service, namely: - telephone exchange, at a bank, in public transportation or in a traffic jam, in a supermarket, at a petrol station, at computer systems, waiting to use an ATM machine, and paying for groceries at the supermarket [1]. Studying how these lines form and how to manage them is called Queuing theory. More generally, queuing

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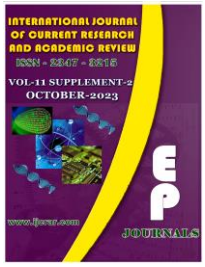

theory is concerned with the mathematical modeling and analysis of systems that provide service to random demands which deals with one of the most unpleasant experiences of life, waiting [2]. A queuing problem arises when the current service rate of facility falls short of the current service rate of customers.

Delays and queuing problems are most common features of our daily-life situations. Queuing theory was born in the early1900s with the work of A. K. Erlang of the Copenhagen Telephone Company, who derived several important formulas for tele-traffic engineering that today bear his name [2].

Erlang was the first who treated congestion problems caused by telephone calls where the company requested him to work on the holding times in a telephone switch. He identified that the number of telephone conversations and telephone holding time fit into Poisson distribution and exponentially distributed [3]. This was the beginning of the study of queuing theory.

Queuing process

The process in queuing system is the customers arriving for service, waiting for service if it is not immediate, and leaving the system once they are served [4] [5]. Typical measures of system performance are server utilization, length of waiting lines, and delays of customers, for relatively simple systems, compute mathematically, for realistic models of complex systems, simulation is usually required [6].

Key elements of queuing systems are

Customer

Refers to anything that arrives at a facility and requires service.

Server

Refers to any resource that provides the requested service,

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Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

System Capacity

A limit on the number of customers that may be in the waiting line or system.

Limited capacity

e.g., an automatic car wash only has room for 10 cars to wait in line to enter the mechanism.

Unlimited capacity

e.g., concert ticket sales with no limit on the number of people allowed waiting to purchase tickets.

Calling population

The population of potential customers may be assumed to be finite or infinite.

Finite population model

If arrival rate depends on the number of customers being served and waiting.

Infinite population model

If arrival rate is not affected by the number of customers being served and waiting.

Random arrivals

Inter-arrival times usually characterized by a probability distribution. Most important model: Poisson arrival process (with rate λ), where A_n represents the inter-arrival time between customer (n-1) and customer n, and is exponentially distributed (with mean)

Scheduled arrivals

Inter-arrival times can be constant or constant plus or minus a small l random amount to represent early or late arrivals.

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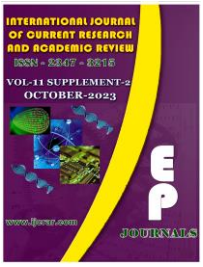

Queue behavior

The actions of customers while in a queue waiting for service to begin, for example:

- **Balk:** leave when they see that the line is too long,
- **Renege:** leave after being in the line when it's moving too slowly,
- **Jockey:** move from one line to a shorter line.

Queue discipline

The logical ordering of customers in a queue that determines which customer is chosen for service when a server becomes free [7]. Some common service disciplines are

First-in first-out (FIFO) Last-in first-out (LIFO)

Service in random order (SIRO) Shortest processing time first (SPT) Service according to priority (PR)

Service times and service mechanism

Service times of successive arrivals are denoted by *S*1, *S*2, *S*3..... These service times may be constant or random. The sequence *S*1, *S*2, *S*3 is usually characterized as a sequence of independent and identically distributed random variables [8].

Queuing Notation

A notation system for parallel server queues: A/B/c/N/K, (due to Kendall) [8], where A represents the inter-arrival-time distribution,

B represents the service-time distribution, c represents the number of parallel servers, N represents the system capacity,

K represents the size of the calling population. Primary performance measures of queuing systems are

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Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Pn : Steady-state probability of having n customers in system,

Pn (*t*) : Probability of n customers in system at time t,

λ: arrival rate,

$_e$: Effective arrival rate,

μ: service rate of one server,

□ : Server utilization,

An : Inter-arrival time between customer n-1 and n,

Sn : Service time of the nth arriving customer,

Wn : Total time spent in system by the nth arriving customer, W^Q : Total time spent in the waiting line by customer n, L(t): the number of customers in system at time t,

$_n$

LQ (*t*) : The number of customers in queue at time t,

L: long-run time-average number of customers in system, *LQ* : Long-run time-average number of customers in queue, w: long-run average time spent in system per customer,

wQ : Long-run average time spent in queue per customer.

Queuing Models

Queuing models provide the analyst with a powerful tool for designing and evaluating the performance of queuing systems. Model as an idealized representation of the real life situation; in order to keep the model as simple as possible however, some assumptions need to be made [9].

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Assumptions

- Single channel queue.
- There is an infinite population from which customers originate.
- Poisson arrival (Random arrivals).
- Exponential distribution of service time.
- Arrival in group at the same time (i.e. bulk arrival) is treated as single arrival.
- The queue discipline is First Come First Served (FCFS).

Although several queuing models abound; designed to serve different purposes [5], highlighted the following:

The M/M/c/∞; there are c servers to serve from a single line customer, if the arrival is less than or equals to c server every customer is being attended to; if z arrival is greater than the c servers, then z-c customers are waiting in the line.

The service utilization for c servers is given by

$$\rho = \frac{\lambda}{c\mu}$$

The average number in the line is

$$L_q = \frac{P_0\left(\frac{\lambda}{\mu}\right)^c \rho}{c!(1-\rho)^2}$$

Where $P_0 = \left[\sum_{m=0}^{c-1} \frac{(c\rho)^m}{m!} + \frac{(c\rho)^c}{c!(1-\rho)}\right]^{-1}$

P_0 denote the probability that there are 0 customers in the system.

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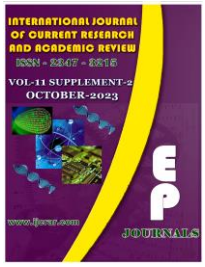
International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



The expected number of customers in the system is $L_s = L_q + \frac{\lambda}{\mu}$ ……(4)

Expected number of customers waiting to be served at any 't' is

$L_w = \frac{c\mu}{c\mu - \lambda}$…….(5)

The average waiting time of an arrival is $w_q = \frac{L_q}{\lambda}$ ……(6)

Average time an arrival spends in the system is $w_s = \frac{L_s}{\lambda}$ ……(6)

M/M/1 Systems

In M/M/1 (∞/FCFS) queuing system, the arrival and service time, both has an exponential distribution, with parameters λ and μ respectively, with one server, queue discipline FCFS and the population size is infinite. The expected inter-arrival time and the expected time to serve one customer are (1/ λ) and (1/μ) respectively. An M/M/1 system is a Poisson birth-death process.

Research Method Used

The quantitative research method was used in this study. Data was collected for a period of six working days. Data were fitted into the model and the results were computed. This model developed was used to predict the required number of servers.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

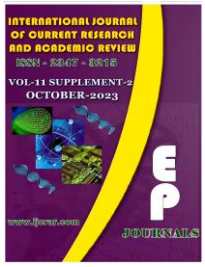

Table.1 Queuing system analysis of the servers for six working days of the week

		Server 1	Server 2	Server 3	Server 4
DAY 1 Monday	**Arrival Rate**	159	99	126	143
	Service Rate	50	32	39	47
DAY 2 Tuesday	**Arrival Rate**	112	136	150	107
	Service Rate	33	44	49	35
DAY 3 Wednesday	**Arrival Rate**	98	97	103	99
	Service Rate	32	29	35	40
DAY 4 Thursday	**Arrival Rate**	109	149	87	133
	Service Rate	35	47	27	50
DAY 5 Friday	**Arrival Rate**	116	123	114	129
	Service Rate	39	42	36	40
DAY 6 Saturday	**Arrival Rate**	89	143	135	94
	Service Rate	24	45	43	31
Total	**Arrival Rate**	683	747	715	705
	Service Rate	213	239	229	243

Average System Utilization	683 = 3.2065 213	747 = 3.1255 239	715 =3.1222 229	705 = 2.9012 243

Table.2 Queuing system analysis of the servers for six working days of the week

		Server 1	Server 2	Server 3	Server 4
DAY 1 Monday	**Average Arrival Rate**	26.5	16.5	21	23.83
	Average Service Rate	8.33	5.33	6.5	7.83
DAY 2 Tuesday	**Average Arrival Rate**	18.66	22.66	25	17.83
	Average Service Rate	5.5	7.33	8.16	5.83
DAY 3 Wednesday	**Average Arrival Rate**	16.33	16.16	17.16	16.5
	Average Service Rate	5.33	4.83	5.83	6.66
DAY 4 Thursday	**Average Arrival Rate**	18.16	24.83	14.5	22.16
	Average Service Rate	5.83	7.83	4.5	8.33
DAY 5 Friday	**Average Arrival Rate**	19.33	20.5	19	21.5
	Average Service Rate	6.5	7	6	6.66
DAY 6 Saturday	**Average Arrival Rate**	14.83	23.83	22.5	15.66
	Average Service Rate	4	7.5	7.16	5.16

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

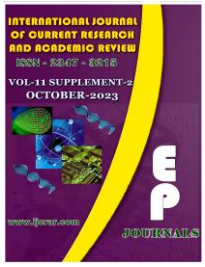

Table.3

	Server 1	Server 2	Server 3	Server 4
DAY 1 (Monday)	3.1812	3.0956	3.2307	3.0434
DAY 2 (Tuesday)	3.3927	3.0914	3.0637	3.0583
DAY 3 (Wednesday)	3.0637	3.3457	3.0463	2.4774
DAY 4 (Thursday)	3.1149	3.1711	3.2222	2.6602
DAY 5 (Friday)	2.9738	2.9285	3.1666	3.2282
DAY 6 (Saturday)	3.7075	3.1773	3.1424	3.0348

Table.4

	Server 1	Server 2	Server 3	Server 4	
Customer Arrival Rate (μ_i)	18.9683	20.7467	19.86	19.58	Average Arrival Rate μ = 19.7888
Customer Service Rate (μ)	5.915	6.6366	6.3583	6.745	Average Service Rate μ = 6.4137
Average No. of Customers Served $\frac{\lambda}{\mu}$ —	3.2068	3.1261	3.1234	2.9028	$\frac{\lambda}{\mu}$ — = 3.0853

Table.5 Results of Performance measures of three server analysis

C	1	2	3	4	5	6	7	8	9
LQ	-4.5649	-5.3213	-38.898	1.8414	0.4155	0.1170	0.0339	0.0095	0.0025
Po	-2.0854	-0.2134	-0.0061	0.0331	0.0424	0.0448	0.0455	0.0457	0.0457
LS	-1.4795	-2.2359	-35.044	4.9268	3.5009	3.2024	3.1192	3.0949	3.0879
WQ	-0.2307	-0.2689	-1.9248	0.0931	0.0210	0.0059	0.0017	0.0005	0.0001
WS	-0.0748	-0.1130	-1.7689	0.2490	0.1769	0.1618	0.1576	0.1564	0.1560

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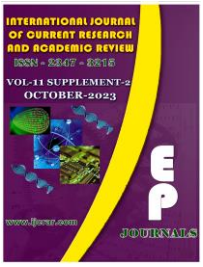

Discussion of Results

From the above table, it has been observed that existing number of service windows required to serve the customers is not sufficient. The suitable number of servers that can serve the customers as and at when necessary without waiting for long before customers are been served at the actual time should be more than four. This increase in number of service windows reduces the waiting time.

Conclusions

The result analysis of the above queuing system shows the need to increase the number of the service windows. The increase in the number of service windows will reduce the time that customers have to wait in line before been served.

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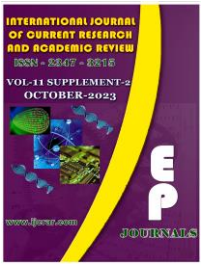

Full Length Article **IJCRAR/FL/49**

Role of AI in Healthcare Using Computer Vision and Medical Imaging

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Abstract

The healthcare business has been intrigued by AI as this novel strategic analytic has improved in accuracy and broadened in applicability. It is proving increasingly beneficial in a variety of contexts, including aiding the discovery of previously unavailable insights into medical decision-making, connecting resources with patients for better management, and extracting advantages from previously inaccessible data assets. Hospital imaging data is a gold mine of patient information, but it may be challenging to parse. Medical professionals, no matter how skilled they are, have a very hard time piecing together high-resolution images from massive data sets of MRI, CAT scans, X-rays, or other testing components. This paper demonstrates how a novel AI method may be explored in depth across a variety of dimensions, yielding promising new avenues for research in the area of medical imaging. This review of the most effective present use illustrates why it may have therapeutic uses. In this study, the potential of AI in the diagnosis of neurological illnesses, bone fractures, cancer, and musculoskeletal problems is explored. Furthermore, the benefits and drawbacks of using AI in healthcare have been highlighted. Qualitative and statistical analysis of secondary data has been useful in examining the details of AI's role in medical imaging. Despite assurances to the contrary, several researchers have expressed doubts about AI's usefulness in healthcare. Despite concerns, the potential for AI to be used in the medical field is promising.

Keywords: Deep learning, Artificial Intelligence, Image processing, Data, Information.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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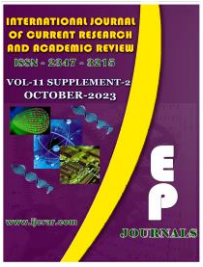
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Introduction

The term "artificial intelligence" (AI) refers to a technology that mimics human intellect but is computer-generated rather than natural. From the business sector to education and health, it has established a recognizable presence for itself everywhere. Because of its many advantages, artificial intelligence has established itself as an integral part of clinical practice within the healthcare sector. This article provides an overview of five distinct uses for AI in the medical imaging industry. This article explores not just the current usage of AI in medicine, but also its possible future applications. The major objective of this paper is to explore future AI-related medical imaging applications. Additionally, in this paper, we propose a method for researching AI's potential to revolutionise the healthcare industry. AI contains a wide potential to examine the many components of clinical research, and researchers are not too terrified of it; rather, they express the thoughts to embrace it. The research presented in this article has uncovered a novel method using AI and discusses the upcoming possibilities for the field of medicine including the implementation of such a method with possible personnel. (Fromherz & Makary, 2022)

Role of artificial intelligence in medical imaging

It is utilized in medical imaging to diagnose a wide range of different illnesses; artificial intelligence may be of use to radiologists and pathologists. There have been many indications that AI tools and components are capable of performing the task of recognizing the characteristics in medical images in a more accurate and expedient manner. The following is a list of the five applications of artificial intelligence that can be found in the field of medical imaging, as well as how AI is affecting the labor force by enhancing its ability to identify potentially deadly disorders. (Brag, 2020)

Recognizing cardiovascular abnormalities

The risk of developing cardiovascular illness and the presence of conditions requiring surgical or pharmacological intervention may be ascertained through measurements of cardiac architecture. Monitoring and controlling the process of identifying various problems utilising basic ordered image detection technologies, such as X-rays, may allow for more rapid treatment decisions. If an

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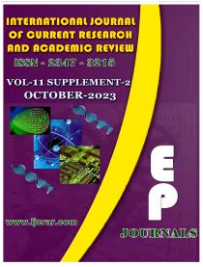

example doesn't make it clear, nothing will. After a patient arrives at the ER complaining of breathlessness, a chest x-ray may be the first image observation made. As cardiomegaly is a potential indicator of serious heart disease, it may be utilised as a part of a preliminary screening process. Inaccurate diagnoses might be made by the radiologist if they relied too much on a short visual inspection. Artificial intelligence may help doctors spot bigger pulmonary nodules on chest x-rays, which might indicate other, more serious pulmonary or cardiac problems that need to be ruled out. In a similar vein, artificial intelligence might be beneficial in automating measuring activities such as the identification of the aortic valve, the carina angle, and the diameter of the pulmonary artery. (Sureka, 2021)

Identifying other fractures and musculoskeletal injuries

Musculoskeletal injuries and fractures, if not treated promptly, may lead to chronic pain and disability. Also on the list of problems that need to be resolved as soon as feasible are issues like hip fractures in the elderly. It is particularly advantageous to employ AI to identify the tiny but most significant fractures, which may be difficult to locate. The use of artificial intelligence by surgeons makes it possible to treat soft tissue injuries and dislocations with more certainty.

Following the accident, this particular sort of fracture is considered to be of minor significance and requires a quicker recovery. The findings are not easily discernible from the x-ray; thus, a comparison must be made with the results of the many previous tests in order to determine the abnormality's evolution over time. The medical experts discover the finest applications for AI in this setting, which assists them in making timely decisions about procurement.

Diagnosing neurological illnesses

Patients having degenerative neurological disorders like amyotrophic lateral sclerosis may get a devastating diagnosis (ALS). Artificial intelligence has a large and vital role in ALS diagnosis. Differentiating amongst primary lateral sclerosis (PLS) but also amyotrophic lateral sclerosis (ALS) and identifying each ailment independently calls for imaging examinations. Recent studies on the identification of ALS and the use of AI to it demonstrate how important speed and accuracy are in this process.

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International Journal of Current Research and Academic Review

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Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

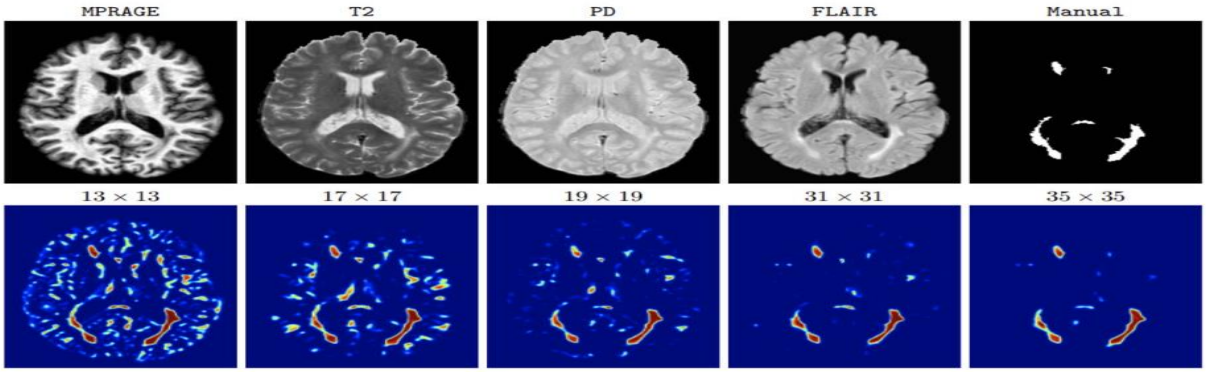
Determining the Presence of Thoracic Complications

AI algorithms have access to pictures and x-rays, which enables them to provide evidence of opacities that suggest pneumonia and offer alerts for possible diagnoses. AI makes it possible to observe and treat patients more quickly. In this regard, artificial intelligence may seem capable of prioritizing both the nature of the problem and the severity of it, which may assist in making decisions in accordance with the sense of urgency. (Subasi, 2023)

Cancer screening and prevention

Imaging procedures performed in a hospital setting are often used to screen patients for common cancers. For example, it might be challenging to locate defects in the breast tissue, such as microcalcification, that are associated with breast cancer. Incorrect diagnosis, often known as a false positive, might result in needless deadly diseases, which is the worst possible consequence. Artificial intelligence (AI) may aid in providing the accuracy and optimal use of imaging features to detect microcalcifications on the basis of suspicion for "ductal carcinoma in situ" (DCIS), which may reduce the likelihood of unnecessary benign biopsies being conducted. In a similar vein, AI may also be beneficial for identifying cancers of the head and neck, colorectal cancer, prostate cancer, or cervical cancer.

Fig.1 Medical Image Processing Using Artificial Intelligence



Potential applications of AI in diagnostic imaging in the future

Human eyes can easily spot issues because they have been educated and have prior experience, where the system for machine learning cannot detect issues with medical picture annotation

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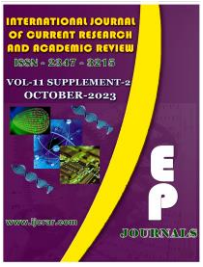

except if the symptoms or concerns are mentioned. Only by using that is it possible to diagnose the problem and provide an informed prediction based on the observable pattern. While there is consensus among experts that the AI application's accuracy much exceeds that of human sight, there are also many who disagree, but on the other hand, many academics believe that the AI application is less beneficial.

Training of AI models for use in medical imaging

The incorporation of key methods into MI is a kind of image marking used by experts to indicate the location of an issue and to draw a picture of it using computer vision. Image annotation is also known as image labeling. Image labeling is also known as image annotation. After the MI has been annotated with the problem, the training of the AI model may take place on a massive scale. Big data is fueled by AI and machine learning, which helps in providing acceptable data for evaluating medical pictures and making predictions about what sort of illness may arise probably in patients. This helps in producing relevant data for analyzing medical images. When it comes to diagnosing illness, artificial intelligence could prove to be more efficient than traditional methods. (Ayache, 2020)

Accurate automated management information

It has been suggested in a number of papers that once a good AI framework has been established, it would be able to detect a number of different diseases in a shorter amount of time than a radiologist can, while also being more accurate and effective. An article on AI in medical imaging was written after extensive secondary data analysis (both quantitative and qualitative).

The numerous areas AI may be put to use in have been categorised via the use of statistics and an analysis of secondary data. Conversely, qualitative research on AI's advancements focuses on their accuracy and potential. Table diagrams have drawn attention to the basic analysis's skewed use of statistical measurement. In this qualitative follow-up, we discuss the potential further development of AI. Incorporating articles by other researchers has allowed for a deeper dive into the issue at hand. The growing use of AI to medical imaging is driven mostly by a desire to enhance the effectiveness and efficiency of diagnostics and therapy. This is because AI can help

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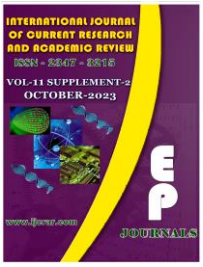

diagnose and treat medical conditions faster and more accurately. Imaging by radioactivity is seeing tremendous expansion.

The effectiveness and efficiency of AI over the course of several years

The phrase "artificial intelligence" comes from the concept of a machine that simulates human cognitive processes, such as the ability to solve problems or acquire new skills. To speak in more broad terms, we might say that it is the process of learning systematically by carrying out activities that depend on a certain algorithm or pattern in order to comprehend and recognize the conceptions. There are several automated methods, some of which even need human intellect in order to be useful in some fields [14]. Artificial intelligence, machine learning, and deep learning are all interrelated and have been used for some time now; they each stand for a different kind of learning methodology. This article discusses the use of AI to medical imaging, and it is noted that the use of these instructional material may be tracked over the course of several years. There has been much investigation concerning the use of AI in clinical diagnostic imaging. Over the course of several years, it has shown remarkable precision in the medical field. On the other hand, the increased sensitivity has arisen as a significant downside with the tiny changes in detecting techniques. (Wolterink & Mukhopadhyay, 2022)

Application of AI in the medical business

By the year 2024, it is anticipated that the global healthcare business for AI based on clinical applications would have reached almost $1.5 billion. Following the rise in its use, artificial intelligence is expected, according to market research and consulting, to take on a prominent role in the world's medical business. The expansion of the market is expected to quicken as a result of covid pan-demic subsidies in AIU-based medical treatment with high annual growth that is expected to rise by 44% by the year 2022. The use of artificial intelligence is developing noticeably, particularly in the diagnosis of different illnesses. It has assumed a prominent position in the treatment of illnesses such as lung cancer, breast cancer, neurological disorders, and cardiovascular diseases since it has approved the opportunity. With its dynamic characteristic, artificial intelligence has a wide range of potential applications in the healthcare fields of the future.

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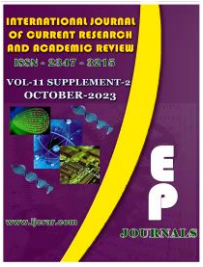

Conclusion

After considering all that has been said about AI in the medical profession, one may get the conclusion that the potential range of applications for AI in the future is going to be quite large. Imaging in medicine is an essential procedure in the clinical sector that assists medical practitioners in making accurate diagnoses of a wide variety of diseases. The most significant medical pictures to have in order to diagnose an ailment are an X-ray, an MRI, a CT scan, and an ultrasound diagnostic. Because artificial intelligence makes it possible for technologies to exist and plays a more significant part in providing a correct analysis of these photos. In all honesty, the computerized vision software uses these photographs to train the machine, and then the artificial intelligence machine detection software assists in the analysis of these images. A standard machine will not be able to identify the sickness as well as other testing methods would. As a direct consequence of this, a vast quantity of medical pictures is utilized to train artificial intelligence models.

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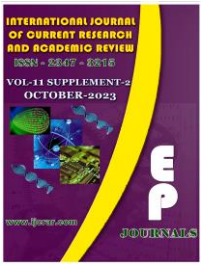

Full Length Article **IJCRAR/FL/50**

Design and Analysis of Vertex Cover Approximation Algorithm

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Abstract

A graph denoted as G=(V, E) consists of a non-empty set of vertices or nodes V and a set of edges E. A subgraph G of a graph is graph G' whose vertex set and edge set subsets of the graph G. Simply put, a graph is a subgraph if it is a part of another graph. A covering graph is a subgraph that contains either all the vertices or all the edges corresponding to some other graph. A subgraph that contains all the vertices is called a line/edge covering. A subgraph that contains all the edges is called a vertex covering. A vertex cover of an undirected graph is a subset of its vertices such that for every edge (u, v) of the graph, either 'u' or 'v' is in the vertex cover. Although the name is Vertex Cover, the set covers all edges of the given graph. Given an undirected graph, the vertex cover problem is to find the minimum size vertex cover. The minimum vertex cover problem is one of the classical problems in mathematics and computer science. However, this problem is considered a complex problem since is classified as NP-Hard. This paper provides information about the approximation algorithm for vertex covering, solving the problem using the approximation algorithm, and finding the optimal solution.

Keywords: vertex cover, approximation, optima solution, polynomial time.

Introduction

Let 'G' = (V, E) be a graph. A subset K of V is called a vertex covering of 'G' if every edge of 'G' is incident with or covered by a vertex in 'K'.A vertex 'K' of graph 'G' is said to be minimal vertex

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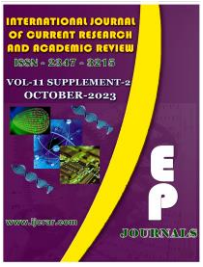

covering if no vertex can be deleted from 'K' A vertex 'K' of graph 'G' is said to be minimal vertex covering if no vertex can be deleted from 'K'. It is also known as the smallest minimal vertex covering. A minimal vertex covering of graph 'G' with minimum number of vertices is called the minimum vertex covering. The number of vertices in a minimum vertex covering of 'G' is called the vertex covering number of G. An approximation algorithm is an efficient algorithm that produces solutions to an optimization problem that are guaranteed to be within a fixed ratio of the optimal solution.

Instead of spending an exponential amount of time finding the optimal solution, an approximation algorithm settles for near-optimal solutions within polynomial time in the input size. Approximation algorithms have been studied since the mid-1960s. Their importance was, however, not fully understood until the discovery of the NP-completeness theory. Many well-known optimization problems have been proved, under reasonable assumptions in this theory, to be intractable, in the sense that optimal solutions to these problems are not computable within polynomial time. As a consequence, near-optimal approximation algorithms are the best one can expect when trying to solve these problems.

Literature Review

A vertex cover of a graph G can also more simply be thought of as a set S of vertices of G such that every edge of G has at least one of member of S as an endpoint. The vertex set of a graph is therefore always a vertex cover. The smallest possible vertex cover for a given graph G is known as a minimum vertex cover and its size is called the vertex cover number denoted ϒ(G). Vertex covers, indicated with red coloring, are shown above for a number of graphs. In a complete k – partite graph, and vertex cover contains vertices from at least k-1 stages.

A set of vertices is a vertex cover if its complement forms an independent vertex set. The counts of vertex covers and independent vertex set in a graph are therefore the same.

A vertex cover having the smallest possible number of vertices for a given graph is known as a minimum vertex cover. A minimum vertex cover of a graph can be found in the Wolfram Language using Find Vertex Cover [*g*].

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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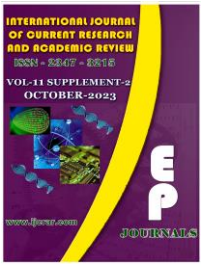

A graph can be tested in the Wolfram Language to see if it is a vertex cover of a given graph using Vertex Cover Q [*g*].

In 1972, Karp [1] introduced a list of twenty-one NP-complete problems, one of which was the problem of finding a minimum vertex cover in a graph.

Ashay Dharwadker find a vertex cover with seven vertices, He presented a new polynomial-time vertex cover algorithm for finding minimal vertex covers in graphs. he provided precise definitions of all the terminology used and he presented a formal description of the algorithm followed by a small example to show how the algorithm works step-by-step. He show that the algorithm has polynomial-time complexity and gave a new condition of sufficiency for a graph to have a minimum vertex cover of a certain size and proved every graph with n vertices and maximum vertex degree Δ must have a minimum vertex cover of size at most $n-\lceil n/(\Delta+1)\rceil$ and that the algorithm will always find a vertex cover of at most this size.

Furthermore, this condition is the best possible in terms of n and Δ by explicitly constructing graphs for which the size of a minimum vertex cover is exactly $n-\lceil n/(\Delta+1)\rceil$. For all known examples of graphs, the algorithm finds a minimum vertex cover. He provided an implementation of the algorithm as a C++ program, together with demonstration software for Microsoft Windows. Also, he demonstrated the algorithm by finding minimum vertex covers for several Examples of famous graphs, including two large benchmark graphs with hidden minimum vertex covers.

In the paper Approximate Solution for Travelling Salesman Problem using MST the author introduced the Travelling salesman problem and discussed Naive and Dynamic Programming Solutions for the problem in the previous post,. Both of the solutions are infeasible. In fact, there is no polynomial time solution available for this problem as the problem is a known NP-Hard problem. There are approximate algorithms to solve the problem though. The approximate algorithms work only if the problem instance satisfies Triangle-Inequality.

*In the paper, New Approximation Algorithms for the Vertex Cover Problem author finds the algorithm has the potential to return any optimal solution.

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Observations

This paper provides information about the approximation algorithm for vertex covering, solving the problem using the approximation algorithm, and finding the optimal solution.

Approximation Algorithm

An Approximation Algorithm is one of the ways to approach NP-completeness for an optimization problem and it returns near optimal solutions. The goal of the approximation algorithm is to come as close as possible to the optimum value in a reasonable amount of time which is at the most polynomial time. This technique does not guarantee the best solution. Approximation algorithms are also called Heuristic algorithms.

For the traveling salesman problem, the Optimization problem is to find the shortest cycle and the Approximation problem is to find a short cycle.

For the vertex cover problems, the Optimization problem is to find the vertex cover with the fewest vertices and the Approximation problem is to find the vertex cover with few vertices.

Approximation Ratio

An algorithm for a problem has an Approximation Ratio of $p(n)$ if, for any input of size n, the cost C of the solution produced by the algorithm is within a factor of $p(n)$ of the cost C^* of an optimal solution: $\max(\frac{C}{C^*}, \frac{C^*}{C}) \leq p(n)$

An algorithm that achieves an approximation ratio of $p(n)$ is a $p(n)$-approximation algorithm. Approximation ratio and $p(n)$-approximation algorithm for Maximization and Minimization problem. Now to find the optimal solution to the following problem

Minimization problem : $0 < C^* \leq C$

Ratio- C/ C^* - factor by which the cost of approximate solution is larger than optimal solution.

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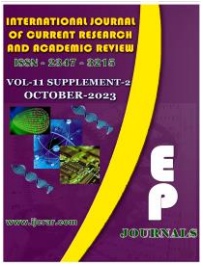
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Maximization problem : $0 < C \leq C^*$

Ratio- C^* / C - factor by which the cost of an optimal solution is larger than the cost of the approximate solution.

Approximation Scheme

*f(n)- approximation algorithm: An algorithm which generates feasible solution iff for every instance I of size n, $[C^* (I) - C(I)] / C^* (I) \leq f(n)$.It is assumed that $C^* (I) > 0$.

*An €- approximate algorithm: f(n)- approximation algorithm for which f(n) ~ € for some constant €

* An Approximation Scheme is a polynomial time approximation Scheme iff for every fixed €> 0 it has a computing time that is polynomial in the problem size.

Vertex Cover Approximation Algorithm

A vertex cover of an undirected graph G= (V,E) is a subset $V \subseteq V$ such that if (u,v) is an edge of G, then either u € V or v€V (or both). The size of a vertex cover is the number of vertices in it.

- The vertex cover problem is to find a vertex cover of minimum size in a given undirected graph
- Minimum vertex cover is called as an optimal vertex cover.
- This problem is the optimization version of an NP- complete decision problem.

Algorithm

- Step 1 : Variable C vertex cover being constructed. Initially C is an empty set,
- Step 2 : Set E to be a copy of the edge set E[G] of the graph.
- Step 3-6 : The loop repeatedly picks an edge (u, v) from E, adds o its end points u and v to C deletes all edges in E that are covered by either u or v.

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International Journal of Current Research and Academic Review

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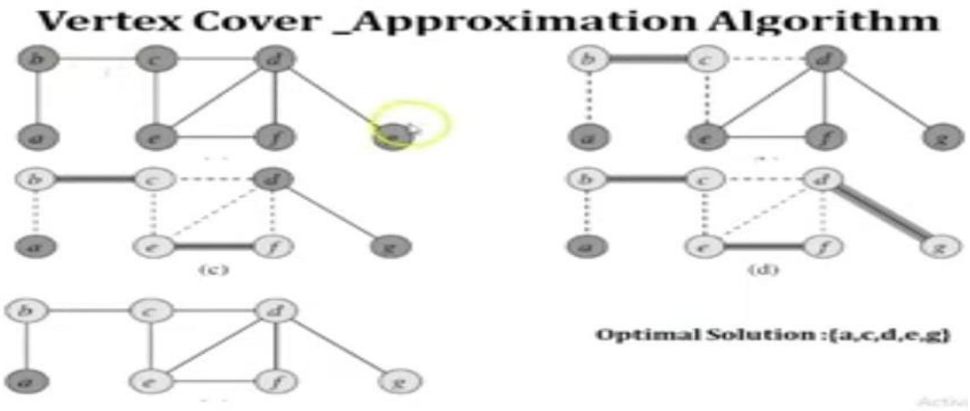
Fig.1



Approx-Vertex-Cover(G)

1.C$\leftarrow \emptyset$

2.E$\leftarrow$ E(G)

3.While E$\ddagger \emptyset$

4. Do let {u,v} be an arbitrary edge of E

5. C $\leftarrow$ C $\cup$ {U,V}

6. Remove from E every edge incident on either u or v

7. Return C

Running time O(V+ E) using adjacency lists to represent E

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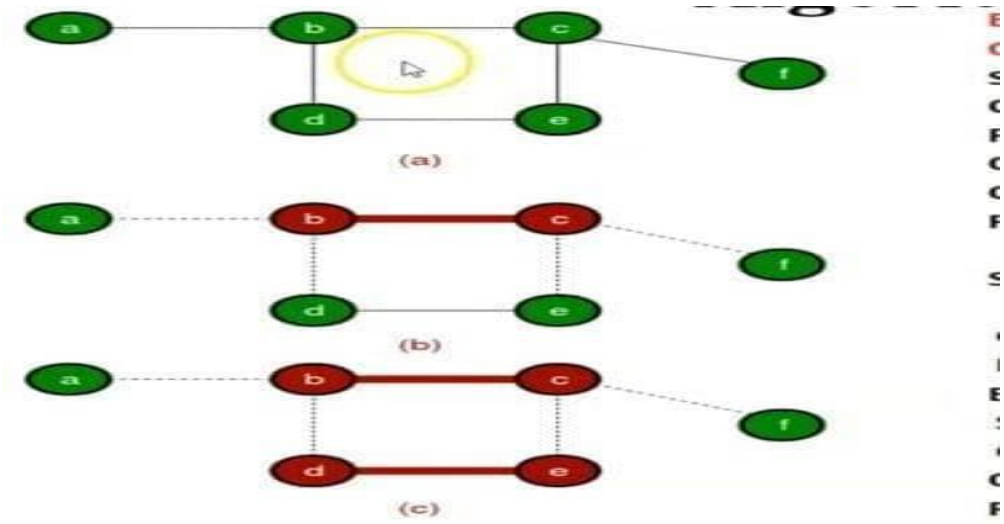
Fig.2 Vertex Cover Approximation Algorithm



E= {ab, bc, bd, de, ce, cf}
C = empty set
Solution 1: Choose {bc}
C= {b, c }
Remove Edges: ab, bc, bd, ce, cf
Step 1:
Choose {de} C={b, c, d, e}
Remove edges: ab,bc,bd,ce,cf,de
Solution 2: Choose {ab}
C={a.b}
Remove edgews: ab,,bd,bc
E= {de,ce,cf}
Step 2
Choose {ce} C={ab,ce}
C={a,b,c,e}
Remove edges: ab,,bd,bc,de,ce,cf

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International Journal of Current Research and Academic Review

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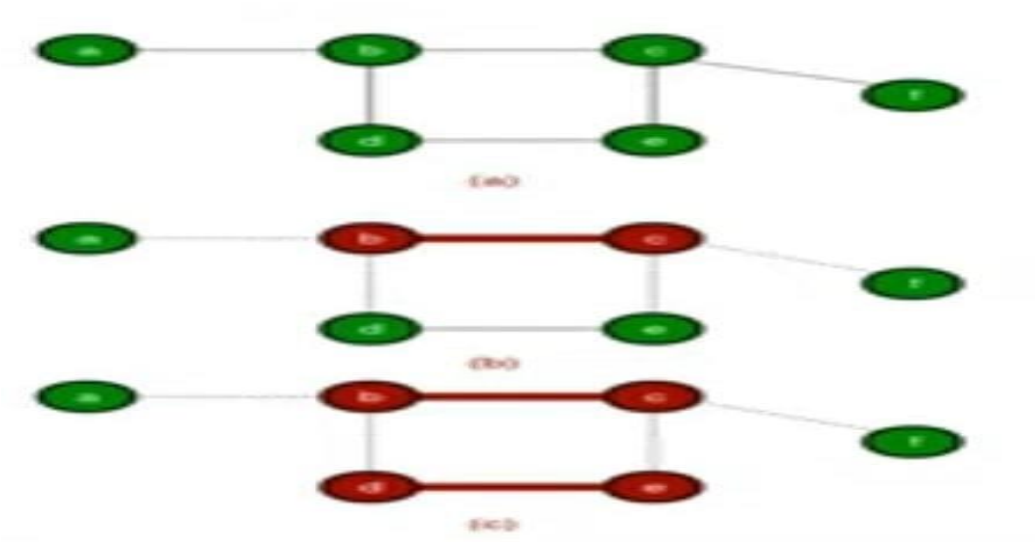
Fig.3 Approximation Vertex Cover



Let A be the set of edges chosen by the algorithm:
$|A| = 2$
The optimal solution C^* must have atleast as many vertices as edges in A:
C= { b, c, d, e}
$|C| = 4$;
C^* = { b, c, e} or { b, c, d}
$|C^*| = 3$

Conclusion

$*|A| \leq |C|$
$*|C| = 2|A|$
Therefore $|C| = 2|C^*|$
That is |C| cannot be larger than twice the optimal, so is a 2- approximation algorithm for vertex cover.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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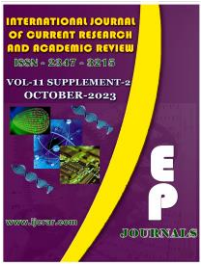

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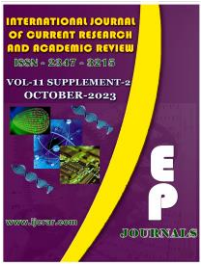

Full Length Article **IJCRAR/FL/51**

Timetable Scheduling Using Graph Coloring Approach

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Abstract

In any educational institution, the two most common academic scheduling problems are course timetabling and exam timetabling. A schedule is desirable which combines resources like teachers, subjects, students, classrooms in a way to avoid conflicts satisfying various essential and preferential constraints. The timetable scheduling problem is known to be NP Complete but the corresponding optimization problem is NP Hard. This study shows application of graph coloring on multiple data sets of any educational institute where different types of constraints are applied. This paper solely focuses on College Course Timetabling where both hard and soft constraints are considered. It aims at properly coloring the course conflict graph and transforming this coloring into conflict-free timeslots of courses. Course Conflict graph is constructed with courses as nodes and edges drawn between conflicting courses i.e. having common students.

Keywords: Graph Coloring, Course Timetable Scheduling, Hard Constraints, Soft Constraints, Course Conflict Graph.

Introduction

In the year 1736, graph theory originated from the Konigsberg bridge problem pointed out by mathematician Euler which later led to the concept of Eulerian graph. While constructing

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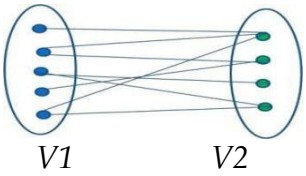
schedule of courses at a college or university, it is obvious that courses taught by the same professor and courses that require same classroom must be scheduled at different time slots. Furthermore, a particular student or group of students may be required by a curriculum to take two different but related courses (e.g., physics and Mathematics) concurrently during a semester.

Basic Concepts of Graph Theory

A graph G is an ordered triplet (V(G), E(G), ϕ) consisting of a non-empty set V of vertices or nodes, E is the set of edges and ϕ is the mapping from the set of edges E and the set of vertices V. In a bipartite graph (or bigraph) (Fig. 1) the set of vertices V can be partitioned into two disjoint sets *V1* and *V2* such that every edge of the graph connects a vertex in *V1* to one in *V2*, i.e. *V1* and *V2* are independent sets.

Fig.1



Scheduling Problem

The general idea of a scheduling problem is defined by allocation of related resources among a number of time-slots satisfying various types of essential and preferential constraints aiming at creating optimized conflict-free schedule.

Some of the typical scheduling problems include-

- Timetable Scheduling

a. Course Timetable Scheduling- courses sharing common resources to be scheduled in conflict-free time-slots.

EXCELLENT PUBLISHERS

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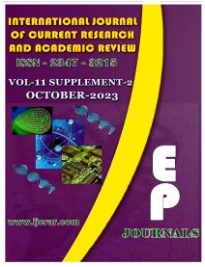

b.Exam Timetable Scheduling – exams sharing common resources to be scheduled in conflict-free time-slots.

- Aircraft Scheduling- aircrafts need to be assigned to flights.
- Job Shop Scheduling- for a given set of jobs with their processing times and a given set of machines, a schedule mapping jobs to machines meeting feasibility constraints and optimization objectives.

Motivation Towards Timetable Scheduling

Effective timetable is vital to the performance of any educational institute. It impacts their ability to meet changing and evolving subject demands and their combinations in a cost-effective manner satisfying various constraints. In this paper, we have focused our work into Course Timetable Scheduling.

Course Timetable Scheduling

Course Timetabling is the scheduling of a set of related courses in a minimal number of time-slots such that no resource is required simultaneously by more than one event. In a typical educational institute resources, which may be required by courses simultaneously can be students, classrooms and teachers.

Teacher-Subject Problem

Problem Definition

For a given 'T' number of teachers, 'N' number of subjects and available 'P' number of periods, a timetable should be prepared. The number of classes for each subject needed by a particular teacher is given in Table.

Input Dataset

Number of teachers- 4 Number of subjects- 5

EXCELLENT PUBLISHERS

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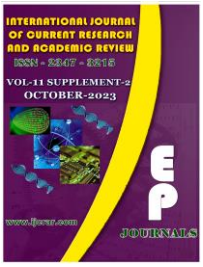

Table.1 Teacher-Subject Requirement Matrix

Periods P	N1	N2	N3	N4	N5
T1	2	0	1	1	0
T2	0	1	0	1	0
T3	0	1	1	1	0
T4	0	0	0	1	1

List of Constraints

Hard Constraints

- At any one period, each subject can be taught by maximum one teacher.
- At any one period, each teacher can teach at most one subject.

Soft Constraints

- Teacher taking two classes of same subject to be scheduled in consecutive periods.
- No more than two consecutive theory classes can be assigned to same teacher for teaching same subject.

Solution

This problem is solved using bipartite graph which acts as the conflict graph. The set of teachers and subjects are the two disjoint independent sets. Edges are drawn connecting a vertex from Teacher set to a vertex in Subject set, indicating that the subject is taught by the respective teacher.

This data is obtained from the Teacher- Subject requirement matrix given in Table. The solution to the problem is obtained by proper edge coloring of the bipartite graph as shown in Fig. 6. The chromatic number acts as the minimum number of periods.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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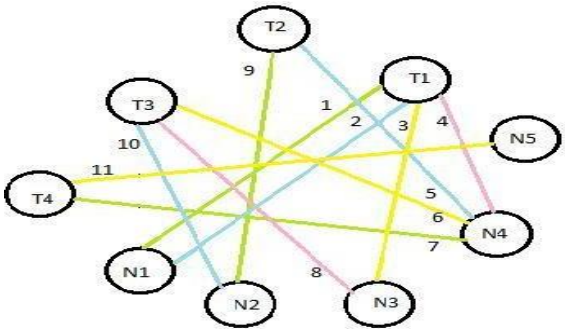
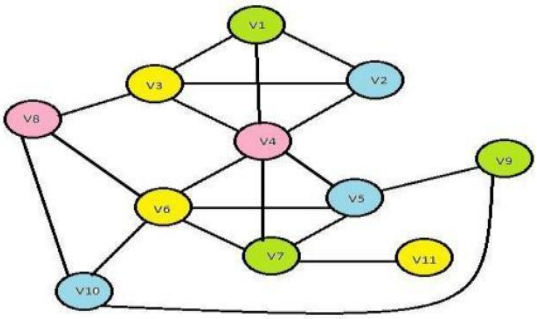
Graph.1 Bipartite Graph G



An alternative way of solving the above problem is by converting the edge coloring problem into a vertex coloring problem. For that the bipartite graph is converted into its equivalent line graph L(G) and a proper vertex coloring of the line graph gives the same solution. This is simply an alternative procedure and is used depending on the type of graph coloring needed to be applied. The eleven edges present in the bipartite graph acts as the vertices of L(G)

Graph.2 Line Graph G



Result

Graph Coloring of the line graph L(G) has been plotted in the solution Table 3 below

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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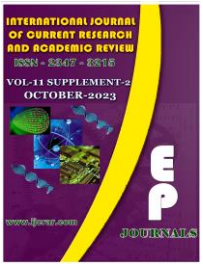

Table.2 Graph Coloring Solution

PINK	GREEN	BLUE	YELLOW
V4	V1	V2	V3
V8	V7	V5	V6
	V9	V10	V11

Table.3 Final Teacher-Subject Allotment Table

Period 1	Period 2	Period 3	Period 4
T1-N4	T1-N1	T1-N1	T1-N3
T3-N3	T4-N4	T2-N4	T3-N4
	T2-N2	T3-N2	T4-N5

Conclusion

The complexity of a scheduling problem is directly proportional to the number of constraints involved. There is no fixed algorithm to solve this class of problem. Here we have studied a typical honours (major) and general (minor) course combination scheduling problem under university curriculum. Uniqueness and optimality are the main concerns in this scheduling. For the same chromatic number, there are many alternative solutions, and thus it is not unique.

Although all the solutions can be claimed optimal when solved using minimum number of colors, a better schedule is one which maximizes satisfaction of soft constraints among its alternative solutions. In addition, we have also studied a teacher-subject scheduling problem where two alternative graph coloring methods (edge coloring using bipartite graph and vertex coloring using line graph) were applied and a complete solution is provided. The dynamic nature of scheduling problem challenges to further experiment with large data sets and complex constraints. An algorithm which can evenly distribute resources among available time-slots without conflict, create unique and optimized schedule and satisfy all hard and maximum number of soft constraints can be called ideal. Finding such algorithm is surely an evolving area of further research.

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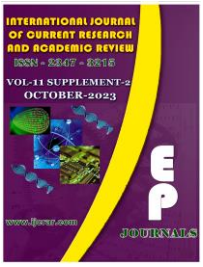

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EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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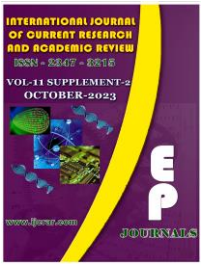

Full Length Article **IJCRAR/FL/52**

Graph Theory Application in Various Fields

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Abstract

Graph theory is a branch of mathematics that is also applied in computer science. It is based on both discrete mathematics as well as applied mathematics. Graph theory is growing area as it is applied to areas of mathematics, science and technology. It is being actively used in fields of biochemistry, chemistry, communication networks and coding theory, computer science (algorithms and computation) and operations research (scheduling) and also used in many application like coding theory, x - ray crystallography, radar, astronomy, circuit design, communication network addressing, data base management In this way it is able to enclose a variety of concepts. Graph theory is the study of relationships. Given a set of nodes and connections, which can abstract anything from city layouts to computer data, graph theory provides a helpful tool to quantify and simplify the many moving parts of dynamic systems. This might sound like an intimidating and abstract concept.

Keywords: computer science, information technology, biosciences, mathematics, linguistics.

Introduction

In the domain of mathematics and computer science, *graph theory is the study of graphs that concerns with the relationship among edges and vertices*. It is a popular subject having its applications in computer science, information technology, biosciences, mathematics, and linguistics to name a few.

EXCELLENT PUBLISHERS

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

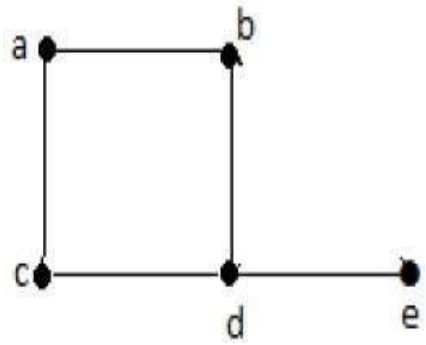
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

A graph is a pictorial representation of a set of objects where some pairs of objects are connected by links. The interconnected objects are represented by points termed as vertices, and the links that connect the vertices are called edges.

Formally, a graph is a pair of sets **(V, E)**, where **V** is the set of vertices and E is the set of edges, connecting the pairs of vertices.

Graph.1



In the above graph,

V = {a, b, c, d, e}

E = {ab, ac, bd, cd, de}

Graph Theory Appication in Computer Science

Computer science graph theory is used for the study of algorithms like:

- Dijkstra's Algorithm
- Prims's Algorithm
- Kruskal's Algorithm
- Graphs are used to define the flow of computation.

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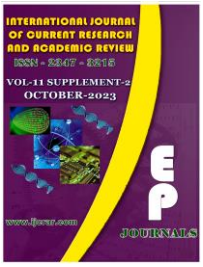

- Graphs are used to represent networks of communication.
- Graphs are used to represent data organization.
- Graph transformation systems work on rule-based in-memory manipulation of graphs. Graph databases ensure transaction-safe, persistent storing and querying of graph structured data.
- Graph theory is used to find shortest path in road or a network.
- In Google Maps, various locations are represented as vertices or nodes and the roads are represented as edges and graph theory is used to find the shortest path between two nodes.

Graph Theory Appication in Electrical Engineering

In Electrical Engineering, graph theory is used in designing of circuit connections. These circuit connections are named as topologies. Some topologies are series, bridge, star and parallel topologies.

Graph Theory Appication in Linguistics

- In linguistics, graphs are mostly used for parsing of a language tree and grammar of a language tree.
- Semantics networks are used within lexical semantics, especially as applied to computers, modeling word meaning is easier when a given word is understood in terms of related words.
- Methods in phonology (e.g. theory of optimality, which uses lattice graphs) and morphology (e.g. morphology of finite - state, using finite-state transducers) are common in the analysis of language as a graph.

Graph Theory Application in Physics and Chemistry

- In physics and chemistry, graph theory is used to study molecules.
- The 3D structure of complicated simulated atomic structures can be studied quantitatively by gathering statistics on graph-theoretic properties related to the topology of the atoms.
- Statistical physics also uses graphs. In this field graphs can represent local connections between interacting parts of a system, as well as the dynamics of a physical process on such systems.

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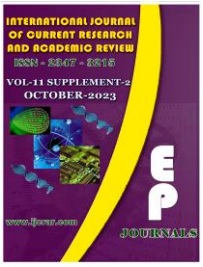

- Graphs are also used to express the micro-scale channels of porous media, in which the vertices represent the pores and the edges represent the smaller channels connecting the pores.
- Graph is also helpful in constructing the molecular structure as well as lattice of the molecule. It also helps us to show the bond relation in between atoms and molecules, also help in comparing structure of one molecule to other.

Graph Theory Application in Google Maps

- A Map is a pictorial representation of a region represented on a flat surface. The effort of a map illustrates detailed features of a geographical area like boundaries, roads, physical features, topography, climates, and natural is time resources.
- Google maps helps in achieving the destination from one place to other. Graph theory is the study of points and lines where set of points are called vertices. Lines connecting points are called edges. Graphs can be either directed or undirected depending upon the walk on one side or both sides.
- The lengths of the edges are called weights from one intersection to other which is the cost for optimization used to evaluate the smallest route from source to the destination. Google map identifies all possible routes from the starting point to the ending point.
- The shortest and quickest route will be displayed by the server.

Graph Theory Application in Biology

- Nodes in biological networks represent bimolecular such as genes, proteins or metabolites, and edges connecting these nodes indicate functional, physical or chemical interactions between the corresponding bimolecular.
- Graph theory is used in transcriptional regulation networks.
- It is also used in Metabolic networks.
- In PPI (Protein - Protein interaction) networks graph theory is also useful.
- Characterizing drug - drug target relationships.

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International Journal of Current Research and Academic Review

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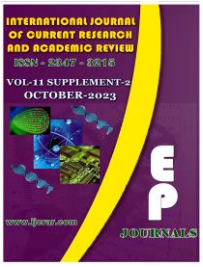

Graph Theory Application in Mathematics

In mathematics, operational research is the important field. Graph theory provides many useful applications in operational research. Like:

- Minimum cost path.
- A scheduling problem

Conclusion

Graph theory allows us to model and analyze the structure of a network. Graph theory, which is mainly topological, favors quantitative as well as qualitative approaches. Graph theory delivered important scientific discoveries, such as improved understanding of breakdown of electricity distribution systems or the propagation of infections in social networks. It is also a powerful tool to investigate key questions in ecology. Graph theory provides a remarkably simple way to characterize the complexity of ecological networks. Indices such as connectance, degree distribution or network topology serve as basic measurements to describe their structure. Such indices facilitate comparison between different systems and revealing commonalities and variations. Nowadays, the relatively important number of network studies leads to a myriads of ways to sample, analyze and interpret them

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EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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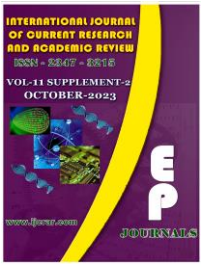

Full Length Article **IJCRAR/FL/53**

Applying Microsoft Hololens to Integrate the Past and Present through Augumented and Mixed Reality in Archeology

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Abstract

With the emergence of cutting-edge technology like the Microsoft HoloLens in recent years, the applications of Mixed Reality (MR) processing have been increasingly evident in academia and the manufacturing industry. An MR experience is one where the user is placed in an interactive setting that is either real with virtual asset augmentation (augmented reality), or virtual with real-world augmentation (augmented virtuality). MR is a very interdisciplinary field by nature, involving signal processing, computer vision, computer graphics, user interfaces, human factors, wearable computing, mobile computing, display and sensor design, as well as information visualization. This paper examines the range of experiments archaeologists are currently undertaking with AR and MR, and it looks to the future applications of these technologies.

Keywords: Microsoft, 3D holograms, real environment, headset, cameras, objects.

Introduction

Microsoft Hololens is an AR headset from Microsoft, which is often also called a "Mixed Reality" headset, highlighting its advanced features of interaction with augmented reality virtual content

EXCELLENT PUBLISHERS

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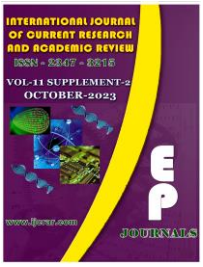
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



via gestures. Microsoft Hololens lets you see the real environment around you, adding the 3D holograms to it. Users can interact with those holograms via hand gestures or voice commands. They can be animated and interactive. The real-world light helps to create holograms in the headset. This means that white appears very bright, and black appears transparent. Some people wonder what is it like to use Microsoft HoloLens. Well, using this mixed reality headset is like working with holographic interfaces in the scientific movie. Also, Hololens has 4 environment-understanding cameras that analyze the environment around you, define the surfaces and objects. The software and algorithms of Hololens are helping it to:

- Understand your movement by analyzing the changes of input from 4 cameras.
- Figure out the real-world surfaces and space, along with positioning the virtual holograms on the surfaces, or in real-world space.
- See the user's hands through cameras, additionally recognizing the gestures.
- Recognize the voice commands via the built-in microphones and voice recognition software.

HoloLens is a standalone, untethered device. It has a built-in CPU and requires no connection to the PC. Spatial and shape data represented by 3D digital models have become a central component of our archaeological datasets. Immersive visual and audio interaction with these models offers an intuitive way to use these data. The mixing of the virtual with the real-world suits archaeological work particularly well, and the technologies of augmented reality (AR) and mixed reality (MR) enable this type of interaction. Given that archaeology naturally deals with the real world and things that are currently in our immediate environment, the ability to combine the virtual and the real may hold greater potential for future applications, such as in the classroom, during field excavation training, and for heritage or data interpretation.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Fig.1 A person is using the Microsoft HoloLens 2 to interact with an archaeological site.

Literature Review

Over the last decade, interest has been building in the deployment of AR and MR for studying the past. For example, Bekele and colleagues (Reference Bekele, Pierdicca, Frontoni, Malinverni and Gain, 2018) surveyed applications in the broader cultural heritage field and found that AR was most often used to enhance public exhibits, but it was also used for the reconstruction of everything from paintings to statues. Within archaeology, research has progressed in a variety of directions regarding the application of AR to our field. Many other researchers have also experimented with using AR to guide tourists through archaeological sites and present locationally aware information superimposed on sites or objects in a landscape or museum (e.g., Morandi and Tremari Reference Morandi, Tremari, Goodman and Addison, 2017; Pierdicca *et al.*, Reference Pierdicca, Frontoni, Zingaretti, Malinverni, Galli, Marcheggiani, Costa, De Paolis and Mongelli, 2016).

Experiments have also begun with public engagement using MR, even though it may not yet be comfortable for visitors to wear an HMD such as the HoloLens for extended periods of time. Bekele's (Reference Bekele, 2019) "walkable MxR Map" provided a room-sized map that was projected on the floor and viewed through the HoloLens. Users could be guided through a museum or heritage site to interact with cultural content using HoloLens methods such as gesture, gaze, and voice activation. Brondi and colleagues (Reference Brondi, Carrozzino, Lorenzini and Tecchia, 2016) attempted to use the HoloLens's gesture capabilities to enhance hands-on training in cultural heritage, particularly intangible culture. When using the device, a user follows the pre-recorded hand movements of printmakers creating stamps or of weavers at a

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International Journal of Current Research and Academic Review

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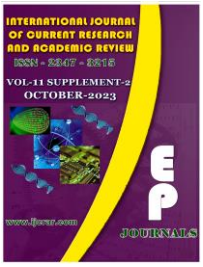

loom. Billing Hurst and Kato [4] reviewed the state of research on collaborative MR of the late 90's and concluded that there are promising applications and ideas, but that they scratch just only the surface of possibilities. It must be further determined, in which areas MR can be effectively used.

Materials and Methodology

Over the last decade, many people have had an to try the new generation of virtual reality devices. VR completely closes off a view of the real world from the user, allowing for full immersion in the virtual environment through sight and sound (Burdea and Coiffet Reference Burdea and Coiffet, 2003). One can imagine several useful implementations of VR in archaeology, such as for public education (Ellenberger Reference Ellenberger, 2017).

Given that archaeologists build interpretations from real objects and spaces, however, technologies that enable the mixing of real evidence with interpretation may better fit our research. Augmented reality (AR) and mixed reality (MR) allow for the visual placement of virtual computer graphics within the real world, with which the user can interact in real time (Azuma Reference Azuma, 1997). For our purposes, we define AR as the simpler implementations that add information or graphics to an environment, whereas MR allows for more sophisticated, spatially aware, and immersive interactions between the virtual and the real.

The difference between AR and MR may be more meaningfully reflected in the various hardware implementations. Many of the latest smartphones and tablets, for example, enable basic AR through software that can place virtual objects into a live view from the camera. Given that most people carry a smartphone with satellite positioning capabilities, AR offers a low barrier to entry for deployment at any site (Jayawardena and Perera Reference Jayawardena and Perera, 2016).

Because of its greater accessibility, AR has also seen much more research focus from archaeologists than MR. MR, on the other hand, works with hardware that places transparent digital screens directly in the view of both eyes by using a head-mounted device (HMD), thereby enabling a stereoscopic 3D view of the virtual world superimposed on the real world. Together with directional audio, this enables a multisensory and fully immersive MR environment, where

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International Journal of Current Research and Academic Review

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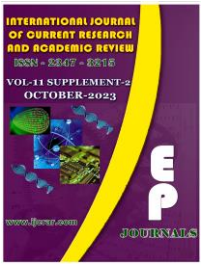
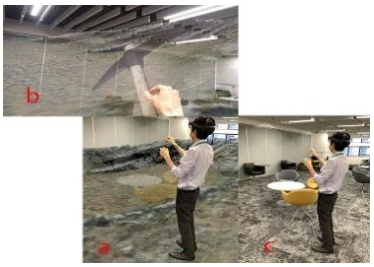


virtual objects are placed seamlessly into the real world from the perspective of the user. MR HMDs have only come to market in the last few years, and they still face several limitations—such as a small field of view—given the enormous processing power required to both create real-time virtual objects and map the spatial layout of the local environment. The Microsoft HoloLens 2 (Figure(a)) is currently the most widely available device, but various other vendors have developed this technology or are planning to enter the market in the next few years (Aniwaa Pte. Ltd, 2021; Fathi Reference Fathi, 2021). These types of HMD should be distinguished from less sophisticated smart glasses that place a small phone-like screen in the peripheral view to convey information.

Fig.2 These images demonstrate different views displayed while a person takes an AR tour of an archaeological site with the HoloLens 2. (a) Site superimposed in a real indoor environment by the HoloLens 2; (b) view from within the HoloLens 2 as the user is trying to grab a pick axe; (c) view from the perspective of a third person who does not see the virtual display.



Conclusion

Recent world events have highlighted the potential benefits that XR technologies can have when opening up remote interaction with archaeological sites and objects, especially for education and training. The global XR market is estimated to grow 18% each year until 2028 (Nigam Reference Nigam, 2021), and virtual museums (Romano Reference Romano, 2020) and virtual site tours (Dziuba Reference Dziuba, 2021) have quickly developed worldwide. Improved hardware will make the MR and AR experiences easier to use, more realistic, and more comfortable. And then, perhaps one day, archaeologists will naturally record new evidence and interact with previously removed evidence while using MR in suit.

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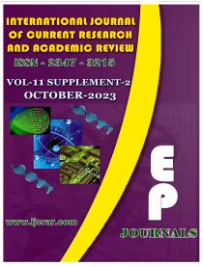

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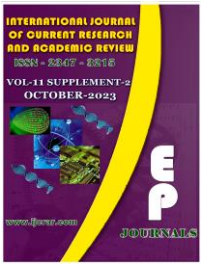

Full Length Article **IJCRAR/FL/54**

A Systematic Study on Approaches of Recommendation Systems in the Field of E-Commerce

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Abstract

The trade of goods and services over electronic platforms like the internet is referred to as electronic commerce or e-commerce. It is essential to the functioning of today's businesses and users. E-commerce platforms also generate an enormous amount of information. A Recommendation Systems or Recommender Systems is an Artificial Intelligence algorithm, usually associated with Machine Learning that uses Big Data to increase customer satisfaction, by suggesting personalized recommendations. These can be based on various criteria, including past purchases, search history, demographic information, and other factors. Recommender systems are incredibly helpful as they guide consumers to discover goods and services they might not have found on their own. This paper produces a study overview of the value of recommended systems and also investigates 4 popular recommendation systems approaches in existence, including Content-Based Filtering (CBF), Collaborative Filtering (CF), Demographic-Based Filtering (DBF), hybrid filtering recommendation systems. It also illustrates a comprehensive and Systematic Literature Review (SLR) on the selected papers published in the field of e-commerce recommender systems. Also, the salient points of each selected paper are briefly reported. A summary table comparing the advantages and disadvantages of each approach and indicating each approach in the fields of application and some interesting examples are provided in this paper.

Keywords: Electronic commerce (e-commerce), Recommender Systems (RSs), Content-Based Filtering (CBF), Collaborative Filtering (CF).

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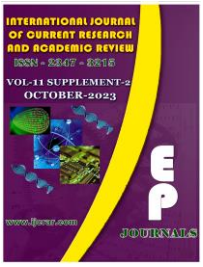

Introduction

Electronic commerce (e-commerce) is the use of Internet platforms for a variety of activities, including promoting, servicing, developing, delivering, selling, and paying for services and goods. The Recommender Systems (RSs) gather knowledge about experiences and beliefs from client behavior and then suggest the goods or services that they believe are the most important among the options.

The paper has intended to review some selected published papers in RSs that concentrate on 4 popular recommendation systems approaches, like Content-Based Filtering (CBF), Collaborative Filtering (CF), Demographic-Based Filtering (DBF), hybrid filtering recommendation systems in the field of e-commerce.

Literature Review

Collaborative Filtering Mechanism

CF is one of the most well-known used methods in RSs, and it links an applicant's data with the data of like applicants based on buying habits to generate recommendations for the user for potential shopping [1]. Collaborative filtering has mostly been implemented using two methods. [3] The memory-based approach and The model-based approach.

Reviewing Selected Collaborative Filtering Mechanisms

Sivapalan *et al.,* [5] demonstrated the significant drawbacks of CF approaches, such as sparsity, scalability, and synonymy, and expressed great personalization for users enabled by using RSs. Wu *et al.,* [7] studied an improved CF-based recommender system for mobile e-commerce to provide personalized recommendations. Lin and Wenzheng [8] created and deployed a customized recommender system for e-commerce. To provide the proper recommendations, the system took into account the key features of each e-commerce project, including user, commodity, and order management.

EXCELLENT PUBLISHERS

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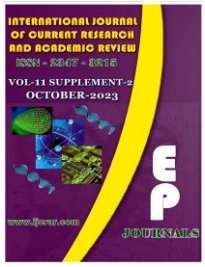

Demographic-Based Filtering Mechanisms

The DBF algorithms use the user's demographic profile, which includes their location, language, age, religion, and other relevant factors, to offer products to them. Using this method, the recommendations become more relevant to the user's reality [9].

Reviewing Selected Demographic-Based Mechanisms

Fan *et al.,*'s [12] use of RSs in e-commerce websites used customer registration data or user demographics as a key source of data mining algorithms. They suggested a four-phased workflow for a customized recommender system in e-commerce. Souali *et al.,* [13] introduced an ethical-based RS using the data related to behaviors and customs with no intervention by the user. The technique was based on a catalog of the ethics and utilized data that was written by clients according to their registration level.

Content-Based Filtering Mechanisms

The RSs use the customer preferences and description of the items to filter the query resulting data and suggest the proper items to the user. Fundamentally, the CBF approaches recommend things or products that are comparable to those that users have previously enjoyed or are now looking for [14].

Review of Selected Content-Based Filtering Mechanisms

Gao *et al.,* [15] expressed that the limited resource is the primary challenge of the CBF approach and also reduces the quality of recommendations. To get better recommendation results, Chen *et al.,* [16] merged various categories of user behaviors and timestamps. Palopoli *et al.,* [17] proposed a distributed architecture of RS depending on a system of the multi-tiered agent to generate more useful recommendations and reduce the operation cost.

Hybrid Mechanisms

We use hybrid RS to combine several algorithms and methodologies to provide a more reliable RS. Hybrid RS offers all the advantages of algorithms while minimizing their drawbacks

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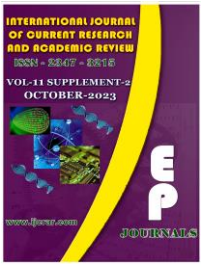

Reviewing Chosen Hybrid Mechanisms

Shaikh, *et al.,* [20] proposed a system that considers semantic factor and sentiment in RS to get an improvement in their recommendations, and they proved their opinion. Zakharov and Philippov [21] proposed a hybrid method for data preparation for recommender systems in e-commerce. They solved the cold-start problem using the Item-Item CF algorithm and User-User CF. Qiu *et al.,* [22] studied the complex e-commerce architecture, which can collect multiple data types, use a difference of recommendation methods for meeting the requirements of various recommendation service sorts.

Summary Table

In this table, we have reviewed and compared several recommendation approaches, indicating each approach, the fields of application and some interesting examples, as well as their advantages and limitations.

Discussion

In future studies, we should look how independent the RS technique is, especially if we're using DBF or hybrid methods, where things like network overhead and security are really important. We didn't include any user demographics in the recommendation algorithm. But if we did, it could really improve our hybrid recommendation system. A lot of researchers didn't pay enough attention to security when they were working on their methodology, so security gets the least attention in the papers.

EXCELLENT PUBLISHERS

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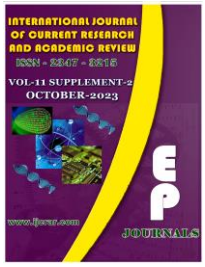

Table.1 Comparing advantages, disadvantages, field of application and some examples of different RS approaches

Approaches	Examples and their fields of application	Advantages	Limitations
Collaborative approach	**Movies:** GroupLens Movie (MovieLens), Bellcore Video, Firefly **Music:** Ringo **TV:** Tivo **E-mails:** Tapestry **E-commerce:** Amazon **Music:** LastFM, Mures	• Independence from the content • Works for any type of items •No overspecialization problem.	• Sparse matrix (sparsity): • Cold start (new user/item) • Scalability • Recommends only the most popular items and cannot recommend items not voted
Demographic approach	**Restaurants** **E-commerce:** LifeStyle Finder, Alambic	• Simple to implement • Requires no history of estimates	• Privacy issues • The lack of diversity • Cold start (New item)
Content-based approach	**In the web**: Letizia, Syskill and Webert, Personal WebWatcher, SiteIF **News:** NewT, NewsDude, YourNews, Informer **Books:** Citeseer **Music:** Pandora **Movies**: Movies2G, INTIMATE **Academic research papers:** Quickstep and Foxtrot	• It is User independence • No cold start problem for new items • Provide Transparency • The quality increases with time	• Traditional keyword-based profiles are not able to capture the semantics of users • Knowledge of the field is often necessary • Overspecialization problem • Cold starta (new user)
Hybrid approach	**Web:** Fab **News:** P-Tango, DailyLearner **Movies:** Netflix, IMDb, CinemaScreen **Restaurants:** EntreeC	• Adapts better with some pure filtering problems, such as cold start, overspecialization, etc.	• Requires additional settings • Unjustified proposals

EXCELLENT PUBLISHERS

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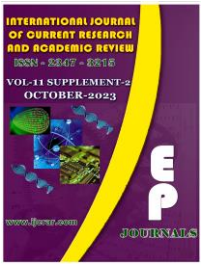

Conclusion

In this article, we examined and compared several recommendation approaches and discusses several proposals that have been submitted to overcome the limitation of each type. Then, we recalled that recommendation approaches generally suffer from a set of problems that reduce performance for a subset of users. We rely on hybrid SRs to overcome these problems. Most modern e-commerce systems are directed towards adding recommendation systems because they increase the efficiency of the commercial site by displaying the most popular products, which makes it easier for the customers to choose the most suitable product for them and thus increase the demand for these sites and thus increase commercial profits. Thus, current recommender systems still require improvement and thus becoming a rich research area.

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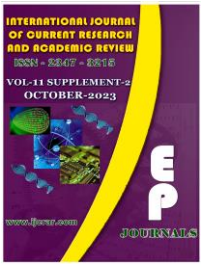

Full Length Article **IJCRAR/FL/55**

Survey Paper on Biometric Recognition Using Deep Learning

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Abstract

In the past few years, deep learning-based models have been very successful in achieving state-of-the-art results in many tasks in computer vision, speech recognition, and natural language processing. These models seem to be a natural fit for handling the ever-increasing scale of biometric recognition problems, from mobile phone authentication to airport security systems. Deep learning-based models have been increasing to improve the accuracy of different biometric recognition systems in recent years. Biometric recognition has emerged as a crucial technology for authenticating individuals based on their unique physiological or behavioural characteristics. In this survey, it is considered how the scientific advances in the field of deep learning are applied to biometrics in order to enhance the protection of data. With the rapid advancements in deep learning techniques, the field of biometric recognition has witnessed significant improvements in accuracy, robustness, and scalability. This survey paper provides a comprehensive overview in biometric recognition using deep learning methodologies. We discuss various biometric modalities, deep learning architectures, datasets, and evaluation metrics commonly used in this field. The paper begins by introducing the concept of biometrics and its importance in various sectors, such as security, healthcare, and authentication. It highlights the limitations of traditional biometric systems and underscores the need for advanced technologies like deep learning to enhance accuracy, robustness, and usability. Throughout the survey, we highlight key datasets, benchmarking challenges, and evaluation metrics commonly used in the respective biometric domains. This survey paper aims to produce the biological identifiers and its applications.

Keywords: Mobile banking, payment apps, health insurance apps, PIN code locks, fingerprints, palm prints.

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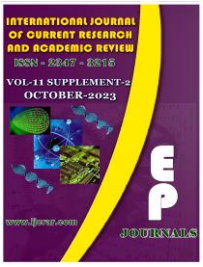

Introduction

Mobile banking and payment apps, health insurance apps, and even password management applications have become increasingly important as the mobile phone and wearable device industries have grown rapidly in recent years. These services all deal with very sensitive information and as a result, need adequate protection. These days, having only pattern or PIN code locks for these services is insufficient since, as security measures advance, so do the techniques for breaking through their barriers. Conventional access mechanisms that rely on IDs and passwords to safeguard digital identities are being quickly undermined by the development of information technology and cyber threats. The biological identifiers include two components: physical descriptors based on body shape, such as fingerprints, palm prints, iris, faces, and ears; and behavioural characteristics, such as gait, signature, keystrokes, and voice, which are connected to attitudes and behaviours of the person.

Literature Review

Physical Characteristics

Face Recognition

Face recognition is the process of recognising a person from an image or frame of video based on their facial features. The US government first started working on face recognition in the 1960s. They construct a semi-supervised system that identifies the essential elements of a face and determines their ratio for identification [1]. Identification accuracy has grown significantly as a result of deep learning and processing capacity improvements. A study was conducted by Khiyari and Wechsler [2] to identify faces across various age groups.

Fingerprint Recognition

The inclusion of fingerprint sensors in smartphones has been an essential shift in order to secure these priceless items. Biometrics in mobile payments has evolved into the next generation of ways to conduct financial transactions. Through the use of a feed forward back propagation neural

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International Journal of Current Research and Academic Review

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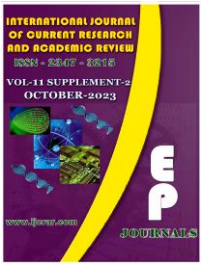

network, Khetri *et al.,* [3] worked on the recognition of fingerprints. They discovered that the CASIA database outperforms the FVC2002 database in terms of performance.

Ear Recognition

Despite all the other biometric traits, the ear has undergone the least amount of alteration through time, making it a crucial component for biometric identification. These ear features were also highlighted by Cintas *et al.,* [4] as they sought to extract features from the ear using CNN. They used a data set from the CANDELA project, and it had a 98.8% accuracy rate. In their study on ear recognition, Dodge *et al.,* [5] used five deep neural networks: AlexNet, VGG16, VGG19, ResNet18, and ResNet50 for feature extraction.

Behavioural Characteristics

Gait Recognition

Gait is another potential candidate for biometric recognition and has also been used in various identification models. Dehzangi *et al.,* [6] studied the identification of human gait. They used five sensors on ten people to get their dataset. They achieved 97.06% accuracy using the suggested strategy. To address the issues with ambient and garment elements, Xu *et al.,* [7] focused on gait recognition using a capsule network. On the basis of a brand-new loss function termed Center-ranked, Su *et al.,*'s[8] work on gait identification with CNN. Gait recognition was the focus of Wu *et al.,* [9]. Different pretrained DenseNet and KNN were utilised for feature extraction and classification, respectively.

Signature Recognition

People have been working on signature as a method of personal authentication for many years. Working with scanned photos, Karouni *et al.,* [10] developed a method for offline signature verification. For classification and validation, they employed ANN. They independently collected the data and achieved a 93% accuracy. Tolosana *et al.,*'s [11] suggested Long Short-Term Memory (LSTM) RNN architecture was used for their work on online signature recognition. For the BiosecurID database, they saw performance improvements ranging from 17.76% to 28.00%.

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Applications of Biometric Recognition

Airport Security

Airports have used biometric technologies for a while. Airports all across the world strive to make traveling through airports more seamless.

Banking

Additionally, customers are concerned about identity theft and the hassle of having to continuously authenticate their identities. As a result, banks are researching the technology for deployment as more and more clients hunt for banks that use biometric authentication.

Home Assistants

Voice recognition as a biometric identification is already commonplace among users of Google Home, Alexa, and Siri. A variety of IoT (Internet of Things) devices, such as lightbulbs, door locks, security cameras, security lights, and more, are compatible with Google Assistant, which runs Google Home and the assistant on Android devices.

Building Access

The most popular biometric for building access is fingerprint recognition, which gives building managers an additional layer of protection. A biometric identification is significantly harder to steal than a key, access card, or PIN number, making it a much more secure approach to safeguard facilities.

Schools / Colleges

Biometric information is utilized for tasks like keeping track of attendance, borrowing books from the library, and even paying for meals, in addition to guaranteeing that only students and authorized adults can enter school/colleges premises. Due to the delicate nature of children and

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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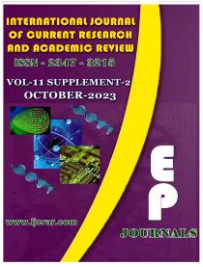
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



privacy, schools must obtain complete, written consent from the parents of students before using the system.

Public Transport

Although the use of biometrics in public transportation is still in its early stages, there are many potential applications, including security and improving the passenger experience. The usage of smart ID cards and smart ticketing to match a person using facial recognition in order to enter transit systems are further applications of biometric technology that make travel safer and streamline the ticketing and passenger management processes.

Discussion

The findings from this study to suggest a contactless biometric recognition technologies are in more demand as a result of the COVID-19 epidemic. To offer a hygienic and practical identification experience, technologies like touchless fingerprint and contactless facial recognition systems should be developed. Biometric recognition systems can be made more accurate and effective by using advanced deep learning algorithms.

Conclusion

An overview of recent research in the area of biometric recognition using deep learning has been given in this article. The application of deep learning to biometrics has been given a thorough examination. Although some biometric methods, like facial recognition, have gained more traction, other biometric characteristics are also gaining ground quickly. Although deep learning models have shown encouraging results, biometric recognition systems still have some difficulties. Real-time implementation comes first since deep nets are slow and need more power and resources to implement. Even during inference, many deep learning-based models require a significant amount of memory. Despite this, in a decade of research, deep learning-based biometric identification has advanced quickly. To create a secure, reliable, and resilient identification system employing deep nets, there is still a long way to go as there are difficulties that must be overcome.

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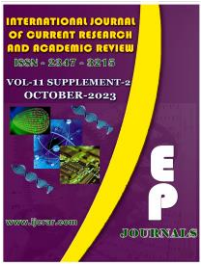

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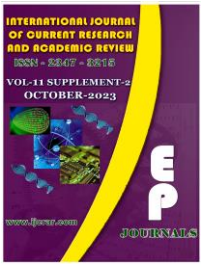

Full Length Article **IJCRAR/FL/56**

Smart Car Automation and Parking Using IOT Technology with Safety Measures

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Abstract

The Internet of Things (IoT) is a modern technology buzzword that makes everyday objects smarter. Driver faces many problems like parking issues, accident and traffic. There is a need to generate a clever device that is Drivers friendly that purposes to provide information like, humidity, temperature, and way, trip travelled, and other things to Drivers. Smart Cars can help to reduce the number of accidents which occur due to many problems like communication, careless driving, poor visibility, etc. This paper also explains the user to find the nearest parking area and gives availability of parking slots in that respective parking area and allows the user to make a reservation for their vehicle in the parking slots. And it mainly focuses on reducing the time in finding the parking lots. Thus, it reduces the fuel consumption. Smart car technology, with its array of sensors, advanced algorithms, and connectivity features, holds great potential for reducing road accidents and improving overall safety.

Keywords: Smart Driving, Smart car parking, Sensors, GPS, Internet of things (IoT).

Introduction

The rapid industrial growth in the world is reflected in increased number of cars on the roads globally. It is expected that the number of cars in the world will increase significantly from 841

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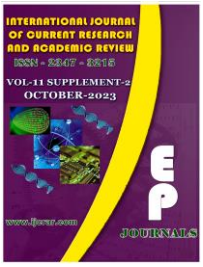

million cars in 2008 to over 1.6 billion cars in 2035. IoT is a dynamic communication system between cars and humans that are supposed to deliver real-time road traffic information and safeguard traveller comfort. The driver has the most responsibility for safe journeys, as he or she must remain alert during the ride.

However, it is difficult to keep his/her attention owing to a variety of factors such as weariness, loudness, drowsiness, and chatting. Due to this carelessness, significant crashes and harm may occur. The primary purpose of automation is to remove manual work, which improves the user experience. Nowadays, the shortage of available car spaces is evident in many public places such as shopping malls and airports etc.

An IoT based smart parking system is a centralized management system that allows drivers to use a smartphone app to search for and reserve a parking spot. The system's hardware features sensors that detect available parking slots and communicate this information to all drivers in the area. This data is updated in real-time, which means drivers never have to worry about not finding an available space. In addition to helping drivers find a spot, the system also sends alerts about peak times and peak prices.

Literature Review

M. Kannan, Mrs. L. William Mary, Dr. C. Priya, Dr. R. Manikandan, *et al.,* proposed a new architecture with an algorithm for better to park the vehicle further in this document, examine the parking availability status of the registered and / or reserved vehicle to park the vehicle and examine the sensor-based intelligent parking system. The main intention of the car parking system is to distribute the slot in the parking area without becoming rigid for vehicle parking.

Khaled Hossain, Sayed Samial Haq *et al.,* presented a method for detection of Car Pre-Crash with Human, Avoidance System and Localizing it through GGSM.

Dr. Khalifa A. Salimbrahim, Mohammed Idrees *et al.,* presented an integrated cost-effective web-based GPS-GPRS vehicle tracking system. The system enables enterprises owners to view the present and past positions recorded of the target vehicle on Google Map through purpose

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
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designed web site. The current position of the vehicle was acquired by GPS device which is integrated in the target vehicle and the location coordinates are sent through GPRS service provided by the GSM network.

Methodologies

Automation

Smart car automation systems are typically categorized into six levels based on their degree of automation. These levels are defined by the Society of Automotive Engineers (SAE) and provide a framework for understanding the capabilities of automated vehicles:

Level 0 (No Automation)

The human driver is in full control of the vehicle with no automation assistance.

Level 1 (Driver Assistance)

Basic driver assistance features, such as adaptive cruise control or lane-keeping assistance, are available. The driver must remain engaged and monitor the vehicle at all times.

Level 2 (Partial Automation)

Advanced adaptive control systems allow the vehicle to simultaneously manage steering and acceleration/deceleration. However, the driver must still pay attention and be ready to take over when needed.

Level 3 (Conditional Automation)

Under specific circumstances, such as on highways, the car can handle the majority of driving-related tasks. However, the driver must be ready to take over when the system asks it, which is usually with little advance notice. The driver has the option to stop using active control.

International Journal of Current Research and Academic Review
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Level 4 (High Automation)

The vehicle is capable of fully autonomous driving in specific situations and environments, such as within a defined geographic area or under specific weather conditions. However, it may still require human intervention in exceptional circumstances.

Level 5 (Full Automation)

The vehicle is fully autonomous and capable of performing all driving tasks under all conditions without any human intervention. There is no steering wheel or pedals, as there is no need for a human driver.

Smart Car Paring System

Working

Parking systems are installed on the outside of buildings or inside of buildings. When a vehicle enters the space, sensors detect its presence and calculate available parking slots. This information is then sent to the driver's phone via an app.

Why it is Need

Smart parking systems solve the problem of finding an available spot by providing drivers with information about available spots near them. Drivers can also use the system remotely via their smartphone to find a space before arriving at the parking lot. These systems help drivers to find an available spot faster and more easily than traditional methods like circling around or waiting for someone to leave. By leveraging this technology, drivers can avoid wasting time looking for a space.

Components of Car Parking System

An interactive map of the area

The interactive map is designed to show drivers' available slots and information about their location, such as how much time they'll be available after purchase.

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Journal home page: http://www.ijcrar.com

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A sensor that provides data on parking availability

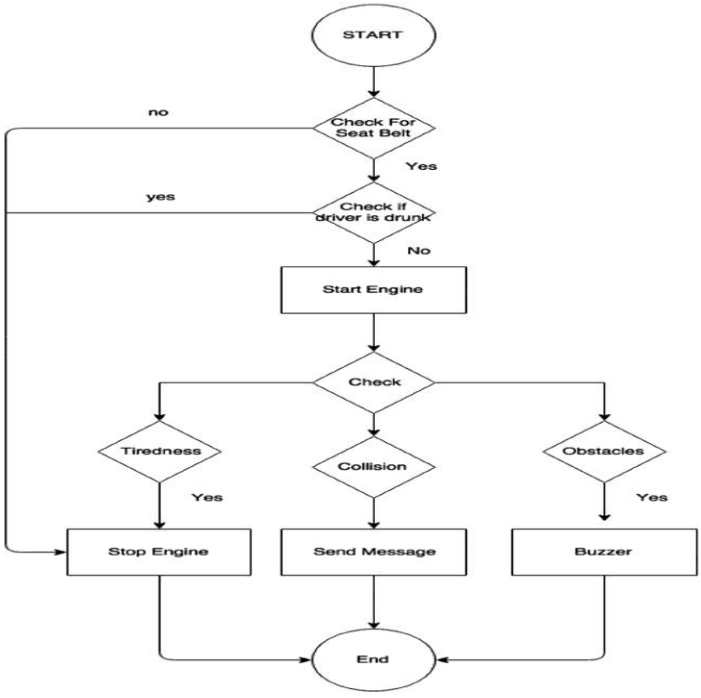
The sensor detects empty spaces and communicates this information to the map and to the driver's phone. This allows drivers to find the best parking space for their needs and keep track of it remotely.

A payment module for convenience

The sensor detects empty spaces and communicates this information to the map and to the driver's phone. This allows drivers to find the best parking space for their needs and keep track of it remotely.

Safety of Smart Cars

Fig.1 Activity Diagram of Smart Cars



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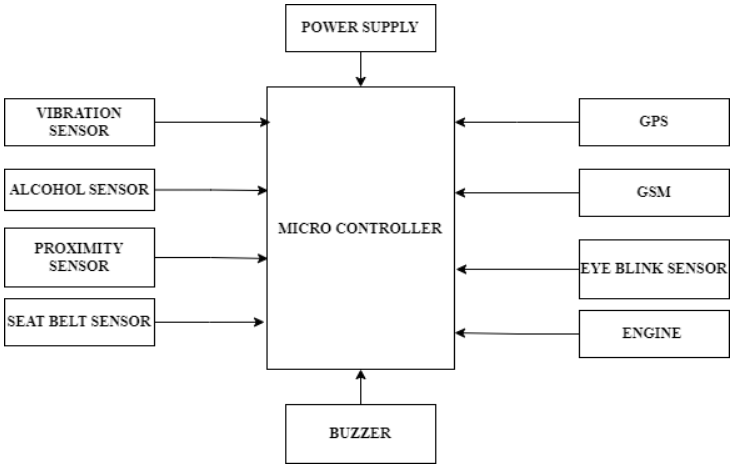
The Smart Car System deals with problem which cause accident and also to ensure safety and security of the person present in the vehicle or is driving the vehicle. It deals with vibration sensor to detect the accident. If the vibration sensor detects the accident, an alert message is sent to the official person which give GPS location. A mechanism involves confirming the assurance of locked seat belt and ensures that until the seat belts are not locked, the vehicle engine would not start. And it also ensures the driver is not drunk through an alcohol sensor. The alcohol senor is used to found the drunken driver only if driver is not drunk then only the ignition will start. The eye blink sensor detects the drowsiness of the driver and give alert using the buzzer. It also deploys a proximity sensor in order to avoid the collision. The automotive proximity sensor is deployed inside the car to find out the interruption in path. All these statuses will be updated on the internet using the concept of Internet of Things and the same will also be deployed on an app.

Fig.2 Block Diagram of Smart Cars



Conclusion

The objectives of this system have been achieved. The hassle in searching for available parking lots has been completely eliminated by reserving the lots via IOT system. An efficient smart vehicle safety and security system embedded with proximity sensor, vibration sensor, alcohol and drowsiness detector using the concept of Global Positioning System, GSM and Internet of things

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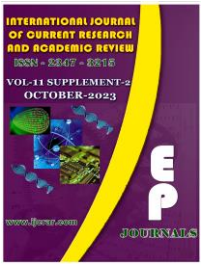

has been proposed. This system helps the driver to avoid accident and in case of accident, aims to provide security to the driver by sending the location of the accident to the authorized phone number via the GSM system installed in the car. With advancements in autonomous driving technology, we can expect improved safety and reduced traffic congestion. As we move forward, a thoughtful and collaborative approach will be essential to harness the full potential of smart car automation for a safer and more efficient transportation future.

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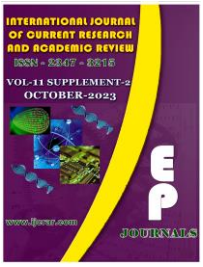

Full Length Article **IJCRAR/FL/57**

Cyber Security Threats and Predication

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Abstract

As society's reliance on technology grows, cyber security risks are both more complex and broader. As systems, networks, and devices become more interconnected, hackers now have more ways to take advantage of weaknesses to steal information, halt operations, and cause harm. It is anticipated that dangers will grow more sophisticated and challenging to identify as technology develops further. Online digital transactions have benefited greatly from recent improvements in e-business, e-healthcare, e-governance, and other related fields. Sadly, it leads to serious cyberattacks. The development of intelligent models for system defense has been made possible by the advent of Artificial Intelligence (AI) technology into the cyberspace. AI technologies have the potential to transform into crucial tools for the cybersecurity sector by fast adapting to new situations. This paper discusses a number of studies that use artificial intelligence (AI) to predict cyber security events. In addition, new advances in cyber security dangers and difficulties are discussed. Overall, the purpose of this article is to provide academics and professionals in the cyber industries with a reference point and guidelines, particularly from the perspective of learning. This paper aims to provide Cyber Security threats and predictions.

Keywords: Cyber Security, Threats, Artificial Intelligence, Cyber Attacks, Predictions.

Introduction

The internet, also known as the World Wide Web, has transformed the way people communicate globally over the past 20 years and has become increasingly integrated into their daily lives. With

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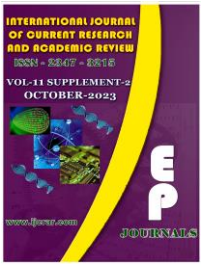

approximately 5.16 billion internet users worldwide, the internet has reached a staggering 64.4% of the world's population [1]. The internet's affordability and advancements have significantly improved its availability, performance, and ease of use, creating a huge global network that contributes billions of dollars to the world economy each year. However, the increased reliance on the internet has also made businesses, government agencies, and financial institutions more vulnerable to cyberattacks.

Cyberattacks, which target businesses, military installations, government agencies, or financial institutions such as banks, are illicit attempts to access protected data or extort a ransom [2]. Cyber threats are becoming a rapidly increasing menace to the online community, as the frequency of attacks and public awareness of the underlying technology continue to rise.

Cyber threats are so prevalent because they are less expensive, more convenient, and less risky than physical attacks, as cybercriminals need only a computer and an internet connection and are not constrained by location or distance [3]. As a result, cybersecurity has become the most important field of study, as it aims to preserve the confidentiality, accessibility, and integrity of data in cyberspace.

Literature Survey

In the modern world, cyberculture has developed into a popular and essential means of exchanging information as well as other professional activities including trade, shopping, banking, ads, and services. Cybercrime has exponentially increased as a result of the exponential growth in online usage. The confidentiality, integrity, and accessibility of information in cyberspace must all be protected. It is essential to continually investigate and create security measures since cyber threats are constantly developing.

Definition of Cyber Security

There has been significant advancement in cyber security research aimed at supporting cyber applications and mitigating key security vulnerabilities faced by these applications. Cyber Security involves the study of various cyber threats and the development of security strategies

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(countermeasures) that maintain the confidentiality, integrity, and availability of digital and information technology,

Types of Cyber Security Threats

Technology is rapidly advancing in a society fuelled by social networks, internet transactions, cloud computing, and automated operations. Cyber criminals are continuously devising new attack techniques, tools, and approaches that enable them to penetrate more complex or tightly controlled environments, cause more harm, and even evade detection.

By using unique methods to gain unauthorized access to networks, applications, and data, attackers attempt to compromise the confidentiality, integrity, and availability of information. Their targets range from individuals to small and medium-sized businesses to multinational corporations. With the total number of attacks increasing each year, cyber threats pose a risk to the security of large businesses, jeopardizing information security, business continuity, and customer confidence.

Fig.1 Cyber Security Threats

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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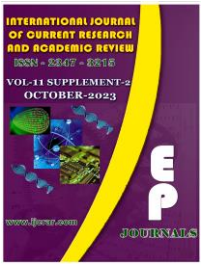

Table.1 Types of Threats

Types of Cyber Security Threats	Characteristics
Denial of Services Attacks	A denial of service (DoS) attack is a type of cyberattack in which an attacker floods a network or website with traffic,
Man-in-the-middle Attack	A man-in-the-middle (MITM) attack is a type of cyber-attack where an attacker intercepts communication between two parties to secretly eavesdrop, modify, or impersonate messages.
Spear phishing	a phishing method that targets specific individuals or groups within an organization. It is a potent variant of phishing, a malicious tactic which uses emails, social media, instant messaging, and other platforms to get users to divulge personal information or perform actions that cause network compromise, data loss, or financial loss.
Phishing	Phishing is a type of cyber attack where criminals use fake emails, websites, or other electronic communications to trick people into revealing sensitive information such as passwords, bank account details, or credit card numbers.
DNS attack	A DNS Attack is any attack targeting the availability or stability of a network's DNS service.
SQL Injection	SQL injection is a code injection technique that might destroy your database.SQL injection is one of the most common web hacking techniques.SQL injection is the placement of malicious code in SQL statements, via web page input.

Cyber Security Threats Predictions

As a result of the rapid growth of computer networks, the quantity of cyber attacks has increased significantly. Information technology (IT) solutions and computer networks are crucial to all

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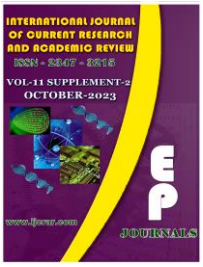
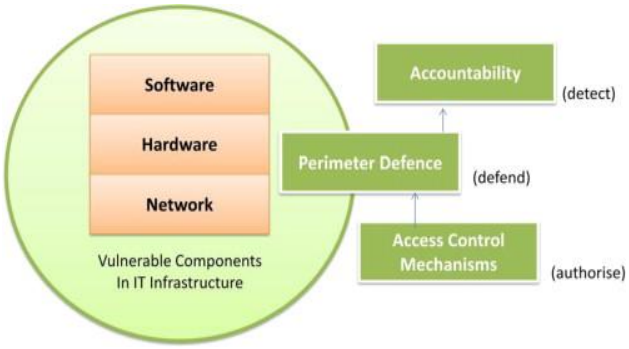


aspects of our society, such as the administration, the economy, and crucial infrastructures. As a result, they are highly susceptible to cyberattacks. A cyberattack involves the use of one or more computers to assault other computers or networks. The goal of such an assault is generally to render the target computer inoperable, incapacitate its services, or gain access to its information. Indeed, upholding cybersecurity has emerged as one of the most challenging responsibilities in the realm of computer science, and it is anticipated that cyberattacks will continue to advance in complexity and pervasive

Fig.2 Vulnerable Components in IT Infrastructure



Discussion

The traditional method has chosen bundled security protection strategies that shield everything within from outside threats, despite the fact that several distinct techniques and ideas exist to address vulnerabilities in the hardware, software, and network layers. To protect their network from any potential outside incursion, the vast majority of businesses use a perimeter defense security strategy. This strategy emphasizes "layered defense" or "defense in depth" tactics in which crucial internal IT assets, like servers or mission-critical data, are guarded by fortifications and walls.

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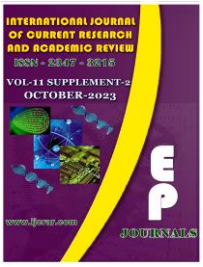

Conclusion

Enhancing defensive capabilities in the digital realm to enhance cybersecurity is one of the most critical issues to be addressed to enable robust societies and modern living that is becoming increasingly reliant on information technology. It is essential to scrutinize past events and predict the future to devise new security measures and software to safeguard socially sensitive data and crucial infrastructure from assailants. Anticipating future cyberattacks can provide benefits to individuals, organizations, and society. Thus, minimizing the attackers' first-mover advantage must be a research priority. In this analysis, we provided a survey of the literature on cyber threats, attack prediction methods, and types. The results indicate that most researchers prefer Artificial Intelligence (AI) techniques,

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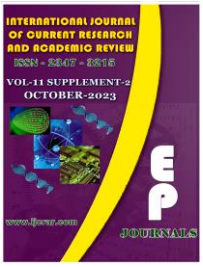

Full Length Article **IJCRAR/FL/58**

A Survey on User Experience (UX) & User Interface (UI) Design

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Abstract

As technology plays an essential function, it has become on with the whole lot, whether it is in terms of making complete troubles less complicated or making an easy and mild person experience. Person enjoyment and user interface are extremely important in today's world. The consumer interface consists of tips, shades, design manners, and many others. The user experience consists of how the person reviews the application. Smart phones evolved continuously in the early 2000s. On account of the fact that hardware capabilities inside the external environment limit their use, it's tough to affirm high interactivity. The design and usage of phone applications have become more complicated, and it's often difficult to understand the interface design. The look-at effects show that these interface design factors have a sizeable effect on people's interplay with phone applications as well as a nice impact on customers' intentions to use mobile programs. Enchantment, attraction, and emotions are divisible by precise conditions; fundamental desires are solid. Whether or not usability is valued in large part depends on the particularity of the scenario. The fulfilment of desires promotes enchantment and emotions. Consequently, designers might also be conscious of signalling the achievement of needs in place of "designing for emotions." E-trade has grown from year to year with the components of the user interface that are getting better. It makes customers acquainted with consumer interfaces that occur in e-trade, which include Tokopedia and Shopee. This paper aims to look at the effect of consumer interface (UI) design in e-commerce on the user experience (UX).

Keywords: User interface, User experience, Design, Application, Interaction, Users, E-Commerce, Design User Interface, Design process.

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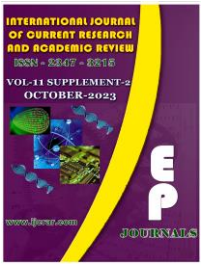

Introduction

User experience [UX] is the communication through interfaces, interactions, and experiences that users have with an organization's products and services. UX contains research on learning about the positive and negative points of the experience and using that feedback to correct the negative points to support the user's experience. The graphic or design is something that is done by our own creativity and is not something that can be taught or learned by going to any institutions. For example: Instagram, WhatsApp updates, etc. Which shows their creativity in designing their apps for efficient and effective use. eBay is a platform for buying and selling all kinds of e-commerce goods. The main page greets the user with a choice for the product category they are interested in.

User Interface [UI] is the interaction between the use of and through the methodology to operate the device, input data, and the use of the contents it applies for the device, like computers, mobile devices, application programs, etc. Smart phones, which are more than simply a communication tool, have become an essential part of modern life. However, the most important reasons are usefulness and ease of use. Interface designs differ accordingly; different interface designs differentially affect the user interface with the system.

According to data recorded in 2007, more than 85% of internet users worldwide purchase products online. Currently in 2023, more than 2.64 billion internet users will purchase products online. The user experience and user interface are two of the most important components of software. The purpose of this research was to analyze the user interface and user experience in the Comrades application. So that the user's purpose can be found through design, the web consists of various contents on a webpage and interacts with various devices to process and utilize information. To cultivate UI/UX understanding and content production ability, UX/UI experts should be fostered with professional course organization and a systematic curriculum.

Literature Review

Vatsal sharma, Ankit kumar Tiwari *et al.,* [1] has described the UX/UI sketch, the trend of changes in UI/UX design and understanding the user experience, based on how the user

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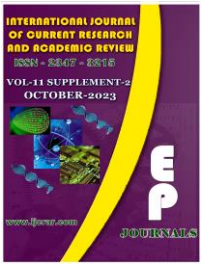

experiences the created design in a better way. People were trying to establish a fixed set of principles to work more evenly and competently.

Winda Suci Lestari Nasution, Patriot Nusa [2] proposed that the "IdeIn" web application has a good level of effectiveness, efficiency, and user satisfaction. The design thinking method aims to create a design that sets the needs of each user so that they can achieve their goal.

Dharmayanti *et al.,* [3] has presented that the existence of user interface recommendations improves the usability of comrades' applications after comparing the appearance of current comrades' applications with displays on prototypes built. The development of the interface using the goal directed design method produces an interface that corresponds to what the user wants to accomplish or matches the user purpose.

Heonsik Joo *et al.,* [4] prescribed that it is possible to cultivate competent IT professionals who have theoretical and practical skills if intensive major subject education is provided for them, and it is necessary to reinforce computer, graphics and design. With the rapid development of IT technology, interface was developed to be Natural User Interface (NUI) such as voice, motion, gesture and biological signal recognition to understand human intentions more intelligently and humanly.

Wonjin Jung, Hyung Rok Yim *et al.,* [5] emphasized how important it is for mobile applications to use recognizable metaphors in mobile application user interface design. And this study explored mobile applications interface design factors. These factors include simplicity, consistency and metaphor. Moreoverly, user interaction with mobile applications also had a positive impact on application user's intentions to use and their attitudes. These results addressed user interface design factors importance for mobile applications.

Ricky Gunawan, Vendly, Geraldi Anthony, Maria Susan Anggreainy [6] has described that the e-commerce user interface must be easy to use, non-repetitive, efficient and user-centered. Every UX/UI design meets to use good and precise layout techniques so that the website has a good design layout and eye-catching, then the colors of the website must be simple and not overcolored, the use of pastel color.

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Tools for Creating UX & UI

Figma

A designing tool used to build interactive user interface prototypes. Users can modify texts, shapes, colors and images. Figma is a vector graphics editor. It is easy to learn and flexible to use. It is available in Ios and Android.

Adobe XD

A vector-based UX design tool. Used to create the design for both web apps and mobile apps. It is completely developed and published by Android Inc.

Sketch

A vector graphics editor which helps the designer to form interfaces and designs for UX/UI. It is only available on macOS.

Fig.1 **Fig.2** **Fig.3**

Purpose of UX/UI Design

The primary goal of any business is to increase its sales and increase the growth of the business. UX/UI design plays an essential role in achieving this goal. The UX/UI design plays an essential role in achieving this goal. The UX/UI design of the application improves the user experience and customer satisfaction, which ultimately helps increase the number of users of the specific application. With users having lots of choices and alternatives for the products and services you are offering them, the span of time you get to grab the attention of your users is quite less.

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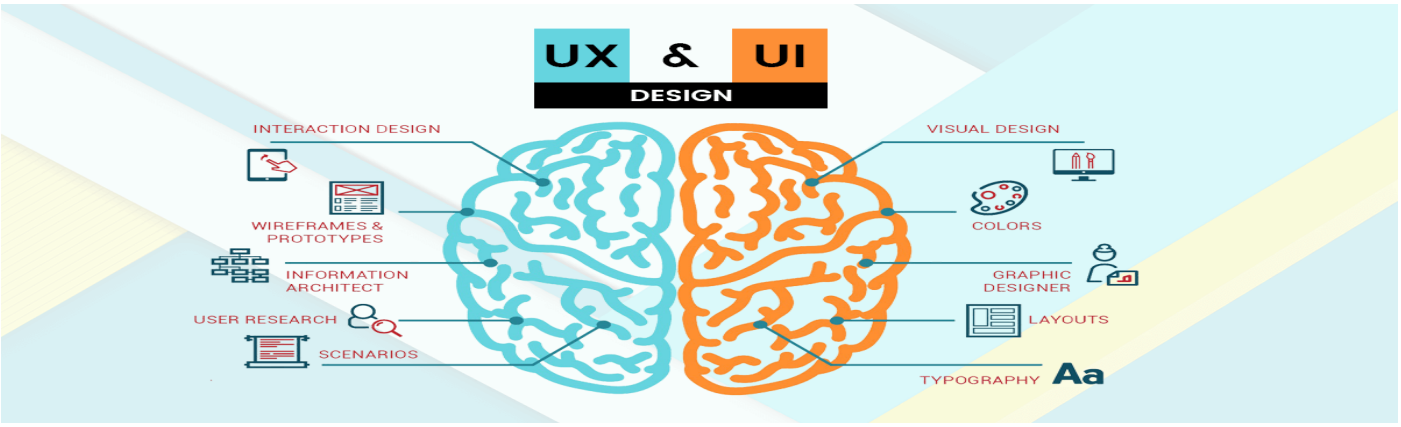
The UI and UX design help to win the consumer's confidence and make them use your application or website providing them with what they are looking for. For a start-up or a small venture, the importance of UI and UX design becomes even more crucial as the first impression lasts long and using UI and UX designing can make or break design brand recognition.

Fig.4 Importance of UX/UI



Pros and Cons of UX/UI

Advantages of User Interface (UI) design

Visual Appeal

Well – designed UIs are visually appealing and can create a positive first impression, making users more engaged with the product.

Clarity

A good UI design ensures that the user interface is clear and easy to understand, reducing confusion for users.

Consistency

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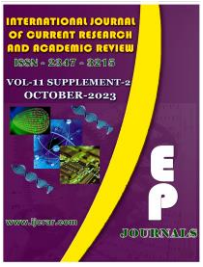

Consistent UI elements and layouts make it easier for users to navigate and learn how to use a product.

Efficiency

A well-designed UI can improve task efficiently, as users can quickly find what they need and perform actions without unnecessary steps.

Disadvantages of User Interface (UI) design

Superficiality

Focusing solely on UI aesthetics without considering the overall user experience can lead to a shallow user engagement.

Subjectivity

What one person finds visually appealing, another might not. UI design can be subjective and may not resonate with all users

Advantages of User Experience (UX)

User-Centered

UX design focuses on the needs and preferences of user, ensuring that the product meets their expectations and provides value.

Problem Solving

UX designers identify and address usability issues, enhancing the overall user journey and satisfaction.

Long-Term Success

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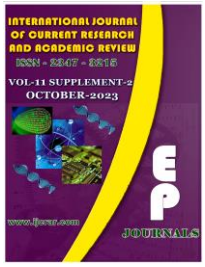

A positive user experience can lead to customer loyality and repeat business, contributing to the long-term success of a product or services.

Date-Driven

UX design often involves user research and data analysis, which can lead to informed design decisions.

Disadvantages of User Experience (UX)

Time Consuming

Conducting user research, testing and iterations can be time-consuming and may slow down the development process.

Subjective Interpretation

Interpreting user feedback and data can be subjective and it may be challenging to prioritize design changes.

Conclusion

The survey paper presents an overview of User experience and User interface design. From the literature review the user experience of a people is based on the how user experiences the design in a better way that they have created. The web application has a good level of effectiveness, efficiency, user satisfaction.

A user interface recommendation improves the usability of applications in comrades. Every UX/UI design to use good and precise layout technique so that the website has a good layout design and attractive. The website must be simple and not over colored, the use of pastel colors is more simple and appealing when the user uses the website.

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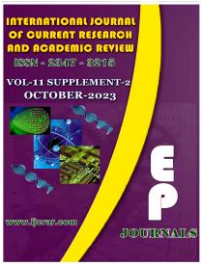

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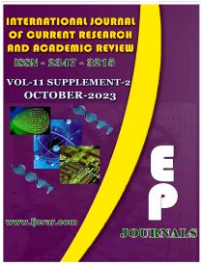

Full Length Article **IJCRAR/FL/59**

Recommendation Systems its Techniques and Active Learning Methods

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Abstract

Recommendation systems have supported the customer to determine information. The fundamental process of an RS is information feedback, as it gives the data that RS needs with a specific end goal to provide appropriate suggestions to the clients given their preferences. This paper explains about feedback techniques and its types along with Active Learning (AL) where the users have more self-awareness while similarly produce novel information to the system that evaluates for consequent recommendations.

Keywords: Recommendation systems, feedback techniques, Active Learning.

Introduction

Recommendation systems have supported the customer to determine information. For utilized as a part of different diverse approaches to encourage its customer with effective information sorting. This technique that provides suggestion based on the customer's flavor to discover a new appropriate thing for them by filtering personalized information establish the user's preferences from a large volume of information. Users' feel and preferences are constructed accurately to provide the most appropriate suggestions. The Recommendation system is filtered personalized information and provides to understand a user's feel. The system is suggested for suitable things

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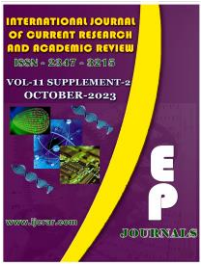

to consider the patterns between their likes and ratings of various things. The process of collaborative recommendation system is followed by,

A recommendation system is an approach to the difficulty like to provide an appropriate thing to the customer despite investigates lots of items. Although People's feel varies from one to another they also follow some pattern. RS techniques that provide a suggestion based on the individual's flavor to find out new essential substance for them like useful products on e-commerce sites like Amazon videos on YouTube, Face book, and online news websites automatically. RS recognizes suggestions consequently to the customers by evaluating previous browsing history, the feedback assigned to the products, and different user's behavior. Recommendation systems frequently produce some suggestions in one of the given techniques.

Recommender Systems Techniques

The fundamental process of an RS is information feedback, as it gives the data that RS needs with a specific end goal to provide appropriate suggestions to the clients given their preferences. Generally, feedback techniques are divided into three types such as Implicit Feedback Technique (IFT), Explicit Feedback Technique (EFT), and Hybrid Feedback Technique (HFT).

Implicit Feedback Technique (IFT)

IFT technique information is attained exclusive of the user's realization but the user's action through the process. The user's feelings and interests are measured without request for the user's consent. An IFT confined and interprets users' feedback by using application domain-dependent tools and several methodologies. This type of IFT establishes in different applications such as browsing history, web consumption history, and mouse movements search pattern. An advantage of IFT can be gathered at a much lower cost and IFT is simple, it does not put a load on the user of the recovery system.

Explicit Feedback Technique (EFT)

This approach involves the users assigning either numeric rating for evaluates the product. The common scenario of explicit ratings is completed on an approved discrete scale. Ratings given on

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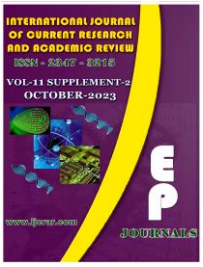

these measures permit these judgments to be handled statistically to provide distributions, averages, and so on. The EFT helps users in communicating their interest and flavor on the particular object. EFT is easy to utilize and the accuracy of EFT appears to be higher than IFT.

Hybrid Feedback Technique (HFT)

HFT is the combination of both IFT and EFT. This approach is used for statistical rating scores and human activities in predicted products of interest and flavor to the users. HFT helps to recover the forecast rating accuracy.

Active Learning in Recommender Systems

Recommender Systems (RS) are frequently assumed to be current items to users to recommend items a user and additional reason for present items in users to discover more preferences. Active Learning (AL) is augmenting RSs the users have more self-awareness while similarly produce novel information to the system that evaluates for consequent recommendations. In quintessence, relating AL to RSs permits for personalization of the recommending process, a concept that creates sense as recommending is essentially geared towards personalization. This is achieved by letting the system actively sway which items the user is exposed to the items present to the user during regular use and letting the user explore interests freely. Unfortunately, there are very few opportunities for the system to obtain information, for a user's browsing history. Since these opportunities are a small number of possible data acquire tells us something important about the user's preferences. After all, one of the most important resources of a company is user data.

AL methods have been categorized based on the explanation of their primary motivation. The sampling is performed with consideration to decision boundaries the primary motivation is classified. In addition, the primary motivation is classified for easier comprehension like instance-based and model-based methods.

Instance-based Methods

A method of this type chooses points based on their property to predict the user's ratings by discovering the other users in the system. Also, the method was called Memory-Based, Lazy Learning, Case-Based, and Non-Parametric.

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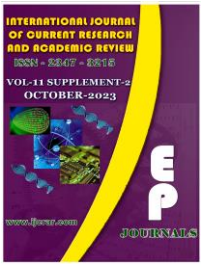

Model-based Methods

A method of this type selects points to best construct a model that describes data supplied by the user to predict user ratings. These points are also elected to maximize the extraction of the expected error of the model. A model-based AL method frequently attains better performance than instance-based methods. Also, the method can optimize label acquisition concerning the underlying predictive model. However, improved performance comes at a cost. The labeled data obtained for the predictive model frequently change throughout the lifecycle of the RS. An AL method for irreconcilable with different model access to specific parameters estimates every time the predictive model changes.

Modes of Active Learning

Batch and Sequential users generally desire to observe the system output something interesting immediately, a common approach is to compute a user's predicted ratings after they have rated a single item, in a sequential approach. Also possible to permits a user to rate several items before rearranging the model. On the other hand, choosing instruction points consecutively allows the system to react to the data provided by users and make necessary adjustments is immediate. Thus a trade-off between Batch and Sequential AL is the usefulness of the data compared to the number of interactions with the user.

Collaborative Filtering (CF) in Recommender Systems

Collaborative Filtering (CF) is generally used and successful technology in Recommender Systems (RS). CF-based recommendation techniques have been greatly achieved, and have an extensive application such as e-commerce and social networks. However, as big data occur, the CF-based approach frequently suffers from several shortcomings, such as data sparsity and scalability which seriously affect the recommended quality of RS. To tackle the problems, data mining and machine learning techniques such as clustering, Singular Value Decomposition (SVD), Probability Matrix Factorization (PMF), and Nonnegative Matrix Factorization (NMF) improve the performance of RS. To determine the difficulties of data sparsity of big data, social features are recently considered to improve the performance such as Reliability-based Trust-aware Collaborative Filtering (RTCF), Recommendation with Social Trust Ensemble (RSTE). A matrix factorization-based model for recommendation in social rating networks (SocialMF) and

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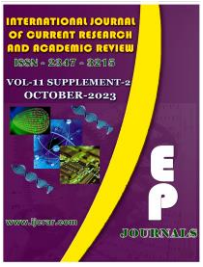

Social Network-based Recommender System (SNRS). An Enhanced Personalized Recommendation Model based on user attributes clustering and rating filling (EPRM) and a Neighborhood-Aware Unified Probabilistic Matrix Factorization (NAUPMF).

User-Based Collaborative Filtering (UBCF)

The user-based CF is that users with alike historical ratings have similar interests, predict the active user's missing ratings on the specific items according to the same users' ratings on given items. Initially, the comparability between the active user and other users is premeditated, and then the neighbors of the active user are selected according to the similarities. Finally, the reviews from the active user are predicted according to the historical preference information of the parallel neighbor users, and the recommendation results are generated.

Item-Based Collaborative Filtering (IBCF)

The user-based CF recommendation algorithm and the item-based CF recommendation algorithm is initially compute the similarity among items according to the user-item rating matrix. Then select the related nearby items according to the similarity. Finally, predict undetermined ratings on the active item according to the neighbor items, and generate a recommended list.

Conclusion

The science of recommendation is just starting—despite impressive progresses, much remains to be understood. For further advances intuition alone is no longer enough and a multidisciplinary approach will surely bring powerful tools that may help innovative matchmakers to turn the immense potential of recommendations into real life applications

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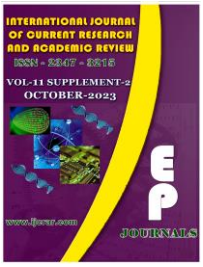

Full Length Article **IJCRAR/FL/60**

Review Article – Rhizophora apiculata – A Mangrove Plant

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Abstract

Mangroves are unique coastal forest ecosystem distributed along the tropical and subtropical region of the world. They are evolutionarily adapted to combat against hostile environmental conditions such as low oxygen, high salinity and temperature. The adaptive features endowed with novel secondary metabolic pathways and bioactive compounds to sustain in harsh conditions. The novel metabolites are rich source of the wide range of bioactive compounds and natural products. It includes terpenoids, alkaloids, phenolics, saponins, flavonoids and steroids. The bioactive and natural compounds may serve as therapeutic precursors and industrial raw materials. It shows the biological activities such as antioxidant, antibacterial, antifungal, cytotoxic, anti-inflammatory, antifeedant effects. This article explained the characteristics of Rhizophora plant.

Keywords: Rhizophora, mangrove, bioactive, salinity, habitat and food.

Introduction

Mangroves form a unique and dominant ecosystem comprised of intertidal marine plants, mostly tress, predominantly bordering margins of tropical coastlines around the world. These halophytic (salt tolerant) plants thrive in saline conditions and daily inundation between mean sea level and highest astronomical tides, and they provide vital structure as habitat and food for similarly adapted resident and transient fauna. Mangrove plants exchange gases from exposed roots using

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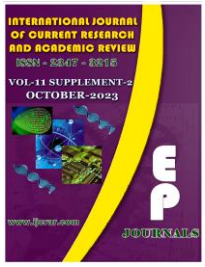

special lenticels, while flooding tides allow uptake of river-borne nutrients and frequent dispersal by their buoyant propagules. The ecological limits defined by the diurnal tidal range explain the setting and why just 70 species around the world are considered to be mangroves (Tomlinson, 1986; Duke *et al.,* 1998), compared with adjacent rainforests that may have hundreds of tree species per hectare (Pannaga Krishnamurthy *et al.,* 2018).

Rhizophora apiculata

Botanical Name

Rhizophora apiculata BI.

Family

Rhizophoraceae (mangrove family).

Common Names

abat (Indonesia), bakau (Singapore, Philippiness), Indo-West Pacific stilt mangroves (English), prop root mangroves (Northeastern Australia), red tall-stilted mangrove (Queensland), spotted leave red mangrove (Western Australia).

Size

Indo-West Pacific stilt mangroves are medium to tall trees that may reach 30-40 m (100-130 ft) in height, although they are commonly much shorter, around 5-8 m (16-36 ft). Stem diameters are often about 15-35 cm (6-14 in) taken just above the highest prop root. This measure differs fundamentally from the standard diameter at breast height used for most forest surveys, as diameter height above the substrate varies from 0.5-7 m (1.6 – 23 ft).

Form

Stilt mangroves are rambling to columnar trees with distinct aboveground prop roots. Trees tend to be of shorter stature and more spreading in shape on the seaward edge of stands or in areas of

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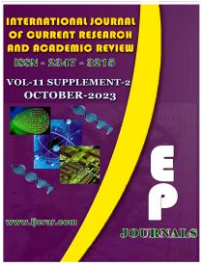

higher salinity. Taller, single-stemmed trees are found most often just behind the water's edge of stands midstream in major riverine estuaries. Multi-stemmed trees are common in more arid or marginal habitats.

Flowering

Flowers are perfect. Inflorescences have few too many joints with 1,2 – chotomous branching and one too many buds possible per inflorescence. Open flowers are located within or below leaf axils at leaf nodes below the apical shoot, depending on species. It contains mature buds and flowers are located at 1-3, 1-5, 3-5, 3-6 and 6-11 nodes down from apical shoot. Calyces are typically pale yellow at maturity with 4 lobes, rarely 3.

Buds are obovate, green when immature to pale yellowish green as they mature, dimensions 1-2 cm (0.4-0.8 in) long and 1 cm wide. Petals, usually 4, are lanceolate to linear, creamy white, wolly to hairless. Stamens number 7-12, pale yellow. Style is pale green, terete, 0.5-6 mm above base, dichotomous tip. Bracts and bracteoles are variable depending on species. Mature bud bracts are swollen corky green. Peduncles are 1-7 cm long and 3 mm wide. Flowering period is chiefly during August – December in the southern hemisphere and during February – June in the northern hemisphere.

Leaves

Leaves are opposite, simple, light or dark green, obovate, leathery, margins revolute, bluntly acute apex with a distinct mucronate tip, 1-7 mm long. Mature dimensions are 6-19 cm long and 3-10 cm wide. Petiole 1-4 mm long. Leaf emergence is mostly around November – February in the southern hemisphere and May – August in the northern hemisphere. Leaf fall occurs mostly during the wet summer period from October – February in the southern hemisphere and April – August in the northern hemisphere.

Fruit

Fruits, when mature are pear-shaped, elongate, waist constriction, smooth brown surface, calyx lobes elongate spreading. *Rhizophora apiculata* mature fruit located in leaf axils 3-5, 4-7 and 8 nodes down from apical shoot.

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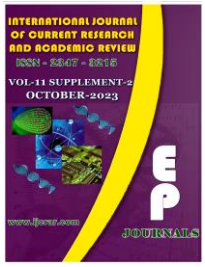

Seeds/ Hypocotyls

Viviparous, that the tree produces seeds hidden in the mature fruit and these germinate on the parent tree. The dispersal unit, a viviparous seedling is called a hypocotyl. One hypocotyl is usually produced from each fruit although on rare occasions twins may be observed.

Hypocotyls are narrowly cylindrical, elongate, green, smooth with irregular small brown lenticles, distal half is slightly wider, distal tip is pointed in most taxa but rounded to blunt for *Rhizophora apiculata*. *Rhizophor aapiculata* mature hypocotyls are located in leaf axils 4–10, 4–9, none, 8–9 and 9–13 nodes down from the apical shoot.

Hypocotyl dimensions are variable and not consistently species-specific, 14-80 cm long, 1-2 cm at the widest point and 0.5-1.5 cm wide at the "collar" the fruiting structure that envelops the plumule (embryonic leaves)."Fruiting" when mature hypocotyls fall, occurs chiefly from November – January in the southern hemisphere and May to July in the northern hemisphere.

Bark

The bark is grey to dark grey and heavily fissured, occasionally red – brown and smooth. Prop roots are sturdy even when relatively thin.

Rooting Habit

Mature trees have distinctive, sturdy, aboveground prop roots surrounding the stem base that anchor only shallowly in the sediments to 1-2 m depth. This conforms to the oxygen deficient (anoxic) conditions commonly measured in mangrove sediments.

Temperature

Mean annual temperature: 20-30^{o}C (68-86^{o}F); Mean maximum temperature of hottest month: 23-38^{o}C (73-100^{o}F); Mean minimum temperature of coldest month: 13-18^{o}C (55-64^{o}F); Minimum temperature tolerated:10^{o}C (50^{o}F).

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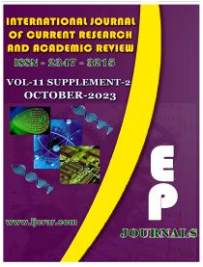

Soils

Trees develop greatest stature and columnar growth form in estuaries of larger tropical rivers, characterized by fine clay, black mud sediments with relatively high loads of organic carbon and anaerobic soils with high concentrations of sulphide. Trees also grow well in sites with aerobic sediments consisting of fine sands to coarse stones and rocks, as well as coral ramparts.

Soil Texture

Plants grow best in light, medium and heavy texture soils (sands, sandy loams, loams, sandy clay loams, sandy clays, clay loams and clays).

Soil Drainage

Plants grow best in soils with free and un-impeded drainage, as well as waterlogged soils.

Soil Acidity

pH 6 – 8.5

Water Filtration by the Outermost Layer of Mangrove Roots

The scarcity of fresh water is a global challenge faced at present. Several desalination methods have been suggested to secure fresh water from sea water. However, conventional methods suffer from technical limitations, such as high-power consumption, expensive operating costs and limited system durability. This study investigated the biophysical characteristics of sea water filtration in the roots of the *Rhizophora* plant. It can grow even in saline water and the salt level in its roots is regulated within a certain threshold value through filtration.

The roots possess a hierarchial, triple layered pore structure in the epidermis and most Na^+ ions are filtered at the first sublayer of the outermost layer. The high blockage of Na^+ ions is attributed to the high surface zeta potential of the first layer. The second layer, which is composed of macroporous structures, also facilitates Na^- ion filtration (Kiwoongkim *et al., 2016*).

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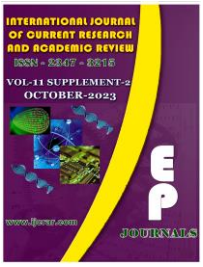

Growth and Water Use of *Rhizophora apiculata* in Response to Salinity

Rhizophora apiculate were grown for 14 weeks in a multifactorial combination of salinity (125 and 350 mol m^{-3}NaCl), humidity (43 and 86% relative humidity at 30°C) and atmospheric CO_2 concentration (340 and 700 cm^3 m^{-3}). Under ambient (CO_2), growth responses to different combinations of salinity and humidity were consistent with interspecific differences in distribution along natural gradients of salinity and aridity in northern Australia. Elevated (CO_2) had little effect on relative growth rate when it was limited by salinity but stimulated growth when limited by humidity. Both species benefited most from elevated (CO_2) under relatively low salinity conditions in which growth was vigorous, but relative growth rate was enhanced more in the less salt tolerant and more rapidly growing species, *Rhizophora apiculata.* Changes in both net assimilation rate and leaf area ratio contributed to changes in relative growth rates under elevated (CO_2), with leaf area ration increasing with decrease in humidity. Increase in water use efficiency under elevated (CO_2) occurred with increase, decrease or no change in evaporation rates; water use characteristics which depended on both the species and the growth conditions. (M.J.Cochrane *et al.,* 2008).

Adaptations of Mangroves to Salinity

Mangroves develop several mechanisms to survive in saline environment. These include morphological, physiological and reproductive adaptations. Morphological adaptations include stilt (support) roots of *Rhizophora.* The effects of salt on mangroves have been studied in relation to their leaf structure, their rates of transpiration, stomatal conductance and photosynthesis (Lovelock and Feller, 2003). Production of viviparous propagules is a reproductive strategy in mangroves that contributes to salt tolerance (Zheng *et al.,* 1999).

Salt tolerance is determined by multiple biochemical pathways which lead to the synthesis of osmotically active metabolites, specific proteins and certain free radical scavenging enzymes to control ion and water flux and support scavenging of oxygen radicals. In mangroves, osmotic adjustment is achieved by the synthesis of compatible solutes, which remain in the cell sap at high concentration and do not interfere with cell metabolism (Flowers *et al.,* 1977). There are studies on the accumulation of low molecular weight organic solutes such as sugars, some amino acids and

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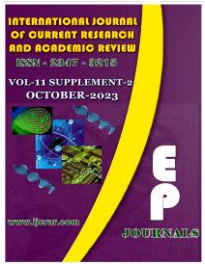

quaternary ammonium compounds involved in the adaptation to abiotic stress (Hibino *et al.*, 2001). Under salinity stress, accumulation of such osmoprotectants, especially in the cytosol, chloroplasts and mitochondria minimizes water loss from the leaf cells (Anushasreeshan *et al.*, 2018).

Antimicrobial Activity of Mangrove Plants

Infectious diseases are the world's leading cause of premature deaths. Furthermore, various hard work has been made to discover new antimicrobial compounds from many kinds of natural sources such as plants, animals, fungi, bacteria and other microorganism. It is because the phenomenon that many pathogenic bacteria become resistant to antibiotics. In addition, many synthetic antibiotics smoothly confirm the terrible effect in term of health and bacterial resistance. Contrary to the synthetic antibiotic, antimicrobials of plant origin are not associated with many side effects and have an enormous therapeutic potential to heal many infectious diseases (P. Saranraj and D. Sujitha, 2015).

The marine world offers an extremely rich resource for important compounds of structurally novel and biologically active metabolites. It also represents a great challenge which requires inputs from various scientific areas to bring the marine chemical diversity up to its therapeutic potential. So far, many chemically unique compounds of marine origin, with different biological activities, have been isolated and a number of them are under investigation or development. (P. Saranraj and D. Sujitha, 2015).

Antioxidant Property of Mangrove Plants

The comprehensive effect of cellular antioxidant resistance becomes weak to produce free radical due to the extreme reproduction of reactive oxygen species (ROS) and loss of antioxidant activity or both (Linochev 2013; Benedetti *et al.*, 2011). The by-products of organic synthesis or extracellular factors are induced ROS generation including hydroxyl radicals, hydrogen peroxide and superoxide radicals. The scavenging efficiency of ROS can serve as a desirable remedy against free radical-mediated diseases including cancer, inflammation. (Rathee *et al.*, 2007). ROS and free transition ions are the cause of complete oxidative stress-related disorder (Droge, 2002).

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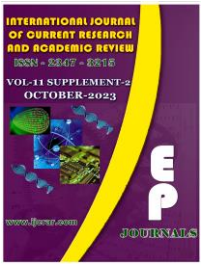

Moreover, chemical antioxidants involve being favourable for toxicity and undesirable reaction that prevent their broad recipe(Ningappa *et al.,* 2008). Consequently, the importance to use of natural antioxidants for prevention of numerous oxidative stress-related syndromes was increased (Ramalingam V and Rajaram R, 2018).

The high amounts of free radicals and other reactive species produced during aerobic respiration in the body can cause oxidative injury of essential macromolecules including amino acids, lipids, proteins and DNA (Nithyanantham, *et al.,* 2013). It has been established that oxidative stress induced by reactive oxygen species (ROS) and reactive nitrogen species (RNS) is the major causative factors in the development of many chronic and degenerative diseases including atherosclerosis, heart disease, aging, diabetes mellitus, cancer, immunosuppression, neurodegenerative diseases and others (Magama *et al.,* 2013; Devasagayam *et al.,* 2004). The most effective way to eliminate free radicals which cause the oxidative stress is with the help of antioxidants. Antioxidants are the substances capable of stabilizing or deactivating free radicals before they are damaging to the cell (Brhane *et al.,* 2018). Both exogenous and endogenous antioxidants act as an effective free radical scavenging and preventing and repairing damages caused by ROS and RNS and promoting their free radical decomposition and suppressing oxidative stress disorders (Tiwari, 2001). Several synthetic antioxidants such as butylatedhydroxytoluene, butylatedhydroxyanisole and tertiary butyl hydroquinone are commercially available for the treatment of oxidative stress-related diseases, but the long-term use concerns due to their side effects such as kidney damage and mutagenesis (Vinay *et al.,* 2010).

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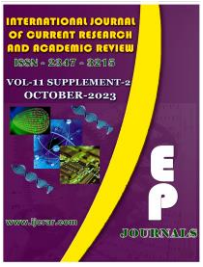

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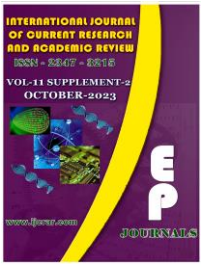

Full Length Article **IJCRAR/FL/61**

Review Article – Management of Solid Waste using Vermicomposting Technology

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Abstract

Vermicomposting is a disintegration cycle including the joint activity of worms and microorganisms. In spite of the fact that microorganisms are liable for the biochemical debasement of natural matter, night crawlers are vital drivers of the cycle, by dividing and moulding the substrate and significantly changing its organic movement. Night crawlers go about as mechanical blenders and by commuting the natural matter they change its physical and synthetic status, bit by bit decreasing its C: N proportion, expanding the surface region presented to miniature creatures and making it considerably better for microbial movement and further disintegration. Vermicompost is a finely partitioned peat-like material with high porosity and water. Use of manure and vermicompost in farming not just lifts the harvest development and improves the yield because of the presence of absorbable types of plant supplements and plant development advancing chemical like substances yet additionally smothers the root microorganisms/soil-borne plant sicknesses.

Keywords: Vermicompost, night crawlers, plant, microbes, urbanization.

Introduction

Municipal Solid Waste (MSW) is one of the significant spaces of concern everywhere on the world. In agricultural nation like India, there is quick expansion in metropolitan strong waste because of urbanization and populace development (Zurbrügg *et al.,* 2008). According to the

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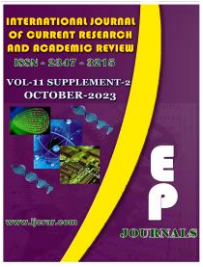

World Bank gauges metropolitan India delivers around 100,000 metric huge loads of MSW every day or roughly 35 million metric huge loads of MSW yearly continuously 2000 Quantity of MSW is expanding because of expansion in populace and fast urbanization Indian urban areas are creating multiple times more MSW by 2006 than they did in 1947. Expected age of metropolitan strong waste until 2025 in India is 700 grams for every capita each day. The metropolitan populace of India is required to develop to 45% of all out from the predominant 28%. Subsequently, the size of MSWM issue is probably going to develop to significantly bigger extents. The common pace of increment of MSW age in Indian refers to is assessed around 1.3% yearly Imura saw that in created nations age of strong waste is more than agricultural nations. Imura *et al.,* announced that MSW age in less created urban communities is 0.3-0.7 Kg/Capita-day, Rapidly creating urban areas is 0.5-1.5 Kg/Capita-day while for created refers to it is more prominent than 1 Kg/Capita-day in Asian nations like India. City strong waste administration (MSWM), a basic component towards maintainable metropolitan turn of events, includes isolation, stockpiling, assortment, migration, convey age, handling, and disposal of strong waste to limit its unfavorable effect on climate. Unmanaged MSW turns into a factor for proliferation of multitudinous sicknesses (Kumar *et al.,* 2009).

Vermicomposting

Vermicomposting innovation is worldwide turning into a popular solid squander the board method. Vermicomposting is the bioconversion of natural waste into a bio-manure because **of** worms' action. The worms feed on the natural waste and the night crawlers' gut goes about as a bioreactor whereby the vermicasts are created. When the natural waste is discharged by the worms as vermicasts, it will be wealthy in nitrogen (N), phosphorous (P) and potassium (K) as well as minor components relying upon the feedstock type utilized. The vermicomposting interaction is a mesophillic cycle and working conditions like temperatures, pH, electrical conductivity and dampness content levels should be upgraded. Typically, the vermicomposting cycle happens in vermi-reactors which incorporate plastic, earthed pots and woodworm canisters (Manyuchi. M. M and Phiri. A)

The vermicompost is a rich wellspring of advantageous microorganisms and supplements (Paul, 2000) and is utilized as a dirt conditioner or compost (Hattenschwile and Gaser, 2005; Rock and

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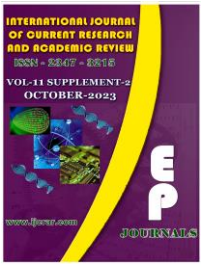

Martnes, 1995). Expansion in crop yield, soil supplements status and supplements take-up were accounted for because of use of vermicompost (Roberts *et al.*, 2007; Singh and Sharma, 2003). The created vermicompost from this innovation has high supplement esteems (offer an entire scope of financial advantages like saving time, power, labor for ranchers of the agricultural nation

During the fertilizing the soil measures, microorganism's status was evaluated at the encompassing temperature. The mesophilic conditions began following a day. Mesophilic conditions went on for around multi week at the temperature of about 40^0 C after which the microorganism's status was again evaluated. After this, temperature at the thermophilic conditions had risen going from to 40^oC to 67^oC.

The thermophilic conditions were surveyed for its populace variety. Further the temperature was chilled off after the thermophilic conditions, permitting fertilizing the soil material to balance out and develop. Physicochemical and natural attributes during these stages were checked and surveyed for a time of about fourteen days. The reactor was run double a day for a time of 15 days during the mesophilic and thermophilic conditions (Chhotu D. Jadia and M. H. Fulekar 2008)

Vermicompost job in the nourishment of agrarian fields has stood out of scientists overall just in ongoing many years (Adhikary, 2012). Vermicomposting is a decay interaction including the joint activity of night crawlers and microorganisms. Despite the fact that microorganisms are answerable for the biochemical debasement of natural matter, worms are critical drivers of the interaction, by dividing and molding the substrate and drastically changing its organic action (Dominguez, Edwars, 2004).

Vermicompost delivered by the action of worms is plentiful in full scale and micronutrients, nutrients, development chemicals, catalysts like proteases, amylases, lipase, cellulose and chitinase and immobilized microflora. The catalysts keep on breaking down natural matter even after they have been catapulted from the worms (Barik *et al.*, 2011). Vermicomposting is a self-advanced, self regulated, self-improved and self-upgraded, low or no energy requiring zero-squander innovation. It is not difficult to develop, work and keep up vermicomposting. Any remaining natural or mechanical innovations for creation of 'bio-compost' are not as great as vermicomposting innovation (Mistry, 2015).

EXCELLENT PUBLISHERS

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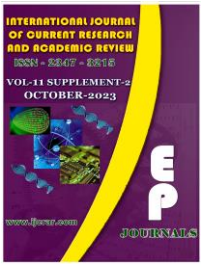

Decomposing organisms in Vermicomposting

Deteriorating creatures are on the whole the miniature life forms and bigger living beings engaged with separating natural material. Microbes are the essential disintegrating microorganism. They show up with the natural material, and start the cycle by separating the natural material for their own food. Microorganisms develop and duplicate while conditions are ideal for them, and cease to exist as they make conditions greater for other people. Microbes, actinomycetes and parasites all devour squander straightforwardly and are known as first level decomposers.

They are helped by bigger creatures - night crawlers, scarab bugs, sow bugs, white worms, and flies - which additionally burn-through squander straightforwardly. First-level breaking down miniature organic entities are eaten by second-level decomposers like springtails, form parasites, feather-winged creepy crawlies, protozoa and rotifers. Third-level decomposers eat both first and second-level decomposers and incorporate centipedes, meander bugs, subterranean insects and ruthless vermin. Living beings at each level of the food web help keep populaces of the lower levels under tight restraints.

Bacteria

Bacteria are abundant. There might be millions in a gram of soil. They exist on each piece of natural matter despite the fact that you can't see them. When presented to natural tissue, microbes "attack" – eating and processing the tissue, separating it into less difficult structures for different microorganisms and living beings to devour.

Collectively, microbes are viewed as healthfully different, which implies that they can eat nearly anything, living or dead. Microorganisms require both nitrogen and carbon that comes from natural materials. The more assortments, the more noteworthy probability they will discover a mix of fundamental supplements. Microorganisms use carbon © as a wellspring of energy and, by oxidizing carbon, produce warmth and carbon dioxide (CO2). Nitrogen (N) is their fundamental wellspring of protein, which is required for weight training and populace development.

International Journal of Current Research and Academic Review
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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Classification of Earthworms

There are in excess of 1800 known types of worm (Minnich, 1977) and these can be partitioned in three gatherings. The morpho-environmental groupings portrayed by Bouche (1977), identify with a few variables including general size, shape and pigmentation, tunnel development, position in the dirt profile, wellspring of food and conceptive potential. The three gathering of worm are:

Epigeics

These are surface tenants filling in as productive specialist of correspondence and discontinuity of leaf litter, have a little body size and display a high conceptive rate, They have no impact on the dirt design, as they can't dive into the dirt, for instance *Eisenia foetida* (Brandling, Red wiggler or compost worm), *Lumbricus rubellus* (Red worms). These are 'grime' or fertilizer worms which live inside natural material.

Endogeics

These make level spreading tunnels inside the dirt getting nourishment from the naturally rich soil they ingest. They significantly affect the decay of dead plants roots; these worms are significant in soil development cycle like blending and air circulation. They have variable body size and are pitifully pigmented, for example *Allolobophora chlorotica* (green worms) *Aporrectodea caliginosa* (dim worm).

Anecics

These are profound 527unnelling, will in general make vertical tunnel up to 3 feet inside and out, have an enormous body size, are unequivocally pigmented, show surface taking care of and projecting conduct, and display a low regenerative rate in the field, for instance, *Aporrectodea longa* (dark headed worms), *Lumbricus terestris* (hurl worms).

Synergistic Role of Earthworms and Microorganism in Vermicomposting

The night crawler movement is significant for the underlying breakdown of plant and creature deposits before the natural matter is reused by the dirt microflora. Night crawlers are significant

EXCELLENT PUBLISHERS

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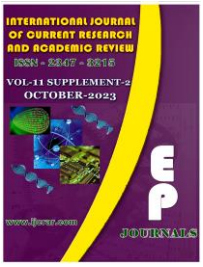

environmental supporters of the cycling and arrival of debris bound supplements and go about as ameliorators of actual properties of the dirt. Helping out microorganisms, worms can speed up the decay of natural matter; improve flow of carbon, nitrogen, and phosphorus and soil ripeness (Hameed *et al.,* 1994). Specifically, protozoa and parasites are expected to shape a considerable piece of their eating routine. Night crawlers put on weight when raised in societies of certain contagious species in light of the chitin present in cell dividers that contains high normal protein and amino polysaccharide.

The consolidated utilization of worms and cellulolytic microorganisms brings about more disintegration of kitchen squander than immunization of night crawlers or cellulolytic microorganisms alone (Das and Talukdar, 2001). Aira *et al.,* (2006) assessed the job of Eudrilus eugeniae in cellulose deterioration, by directing a test on pig slurry with microbial rich substrate in limited scope vermireactors with and without worms. The presence of night crawlers in vermireactors expanded fundamentally the pace of cellulose decay (0.43% and 0.26% cellulose misfortune each day, with and without worms, individually).

Notwithstanding, the immediate commitment of *Eudrilus eugeniae* to debasement of cellulose was not huge, despite the fact that its quality expanded microbial biomass and compound action (cellulase and beta-glucosidase). The movement of *Eudrilus eugeniae* set off contagious development during vermicomposting which prompted more exceptional and productive cellulolysis. The presence of parasites during vermicomposting measure is an extra enhancement to the worms that added to the expanded number and weight of the night crawlers.

Effect of vermicompost on plant growth

Since years and years, city sewage slop has been progressively utilized in various nations all throughout the planet as manures on ranch lands in light of their high substance of natural matter and fundamental supplements that favour crop development (Spinosa and Vesilind, 2001). Saddling this loss through vermicomposting could mean removal of the loss alongside significant excrement yield, which could be added to the dirt with no negative impacts on crop development. Use of manure and vermicompost in farming not just lifts the harvest development and improves the yield because of the presence of absorbable types of plant supplements and plant

EXCELLENT PUBLISHERS

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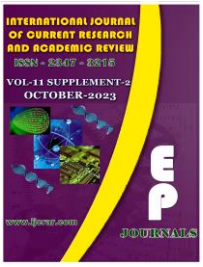

development advancing chemical like substances yet additionally smothers the root microorganisms/soil-borne plant sicknesses (Hoitink, 1980; Perner *et al.,* 2006). It improves the dirt fruitfulness when applied preferring higher profitability (Kale *et al.,* 1992; Reddy and Ohkura, 2004; Padmavathiamma *et al.,* 2008; Samantara and Reddy, 2009).

There is gathering logical proof that vermicomposts can impact the plant development and efficiency essentially (Edward, 1998), and that vermicompost helps plant development (Rajkhowa *et al.,* 2000). It has been accounted for to affect development and yield boundaries of various vegetables like tomato (*Lycopersicum esculentum*), brinjal (*Solanum melongena*) and okra (*Abelmoschus esculentus*) (Atiyeh *et al.,* 2000), decorative and blooming plants (Atiyeh *et al.,* 2000) and field crops (Arancon *et al.,* 2004).

Advantages of Vermicomposting

- Reduces waste disposal costs.
- Produces less smell and draws in less irritation.
- Saves power and water utilized for in-sink waste disposals.
- Produces free, great soil correction.
- Requires little space, work, or upkeep. Produces free worms for fishing.

Conclusion

Civil strong waste (MSW) is one of the significant spaces of concern everywhere on the world. In agricultural nation like India, there is quick expansion in city strong waste because of urbanization also, populace development. Synthesis of waste shifts with various elements like expectation for everyday comforts, climatic condition, and financial factor and so on. Vermicomposting is a decomposition process involving the joint action of earthworms and microorganisms. Although microorganisms are responsible for the biochemical degradation of organic matter, earthworms are crucial drivers of the process, by fragmenting and conditioning the substrate and dramatically altering its biological activity Vermicompost is optimal organic manure for better growth and yield of many plants. It can increase the production of crops and prevent them from harmful pests without polluting the environment.

EXCELLENT PUBLISHERS

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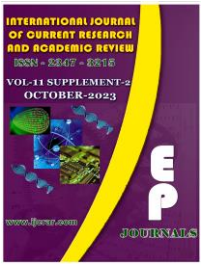

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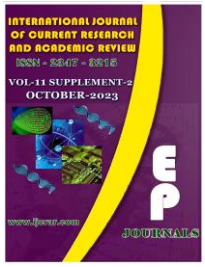
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Full Length Article **IJCRAR/FL/62**

Applications of (P,Q) - Gegenbauer Polynomials on a Family of Bi-Univalent Function Associated with the Hohlov Operator

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Abstract

The (P,Q) - gegenbauer polynomials, which are connected to the Hohlov operator, are introduced and studied in this study for a family of analytic and bi-univalent functions defined in the open unit disc. We discover estimates for the coefficients for the new subclass's functions. A corollary was provided to demonstrate certain outcomes of a particular subclass of our new class.

Keywords: Analytic functions,Bi-univalent functions,Hohlov operator,Univalent func- tions,Schwarz function,(p,q)- gegenbauer polynomials, coefficient estimates,subordination

Introduction

"Let A represent the forms class.

$$f(z) = z + \sum_{n=1}^{\infty} a_n z^n \tag{1.1}$$

which are analytic in the open unit disk

$$\Delta = \{z : z \in C, |z| < 1\}$$

International Journal of Current Research and Academic Review
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Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

The class of all functions in A that are univalent in Δ will also be denoted by S. In math- ematics, the convolution or Hadamard product of two functions f, h ∈ A is symbolised by the symbol f ∗ h and is defined as

$$(f * h)(z) = z + \sum_{n=1}^{\infty} a_n b_n z^n \tag{1.2}$$

where f(z) is given by (1.1) and

$$h(z) = z + \sum_{n=1}^{\infty} b_n z^n \tag{1.3}$$

Dziok and Srivastava proposed and extensively explored the dziok- srivastava linear oper- ator involving the generalised hypergeometric function in terms of the hadamard product (or convolution) [5,4] and [subsequently] by numerous other authors.Here, in our current study, we are reminded of the well-known convolution operator Ia,b,c credited to Hohlov [8,9]. Which is a highly specific instance of the widely studied Dziok-Srivastava operator. The Gaussian hypergeometric function F1(a, b, c; z) is defined as follows for the complex parameters a, b, and c with is not equal to 0,-1,-2,...

$$F_1(a, b, c; z) = \sum_{n=1}^{\infty} \frac{(a)_n (b)_n z^n}{(c)_n n!}$$

$$F_1(a, b, c; z) = 1 + \sum_{n=1}^{\infty} \frac{(a)_{n-1} (b)_{n-1}}{(c)_{n-1} (n-1)!} \tag{1.4}$$

where the pochhammer symbol α_n is defined as follows

$$(\alpha_n) = \frac{\Gamma(\alpha + n)}{\Gamma(\alpha)} \tag{1.5}$$

EXCELLENT PUBLISHERS

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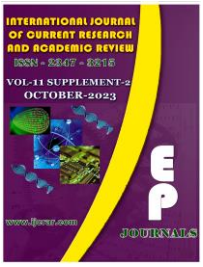


Hohlov [8,9] proposed the well-known convolution operator $I_{a,b,c}$ using the gaussian hypergeometric function provided by (3).

$$I_{a,b,c} = Z_2F_1(a,b,c;z) * f(z) = Z + \sum_{n=2}^{\infty} \varphi_n a_n Z^n, (Z \in U) \tag{1.6}$$

where

$$\varphi_n = \frac{(a)_{n-1}(b)_{n-1}}{(c)_{n-1}(n-1)!} \tag{1.7}$$

Hohlov [8,9] discussed a number of intriguing geometrical characteristics that the operator Ia,b,c displayed. The majority of the well-known linear integral or differential operators are included as special cases in the three parameter family of operators $I_{a,b,c}$. In instance, $I_{a,b,c}$ reduces to the Carlson-Shaffer operator if b=1 in (1.6). Similarly, it is clear that the hohlov operator $I_{a,b,c}$ is a generalisation of both the Bernaldi-Libera-Livingston operator and the Ruscheweyh derivative operator.

The class S∗(α) of starlike functions of order α in U and the class K(α) of convex functions of order α in U are two notable and well-studied subclasses of the univalent function class S. Every function in S has an inverse, known as f −1, which is defined by

$$f^{-1}(f(z)) = z, (z \in U)$$

and

$$f(f^{-1}(w)) = w, \qquad (|w| \leq r_0(f); r_0(f) \geq \frac{1}{4}). \tag{1.8}$$

where

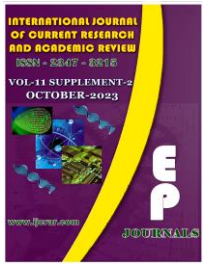
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



$$f^{-1}(w) = w - a_2w^2 + (a2_2^2 - a_3)w^3 - (5a_2^3 - 5a_2a_3 + a_4)w^4 + ... \quad (1.9)$$

If both f (z) and f−1(z) are univalent in U, then a function $f \in$ A is said to be bi-univalent in U. Using (1), let $\sum$ represent the class of bi-univalent function class in U. Lewin [10] studied the bi-univalent class $\sum$ in 1967 and demonstrated that $|a2| \leq 1.51$. On the other hand, Brannan and Clunie [1] (see also [2,3,15]) and Netangahu [12] attempted to introduce several bi-univalent function class $\sum$ subclasses and achieved non-sharp coefficient estimates on the first two coefficients $|a2|$ and $|a3|$ of (1). However, each of the following Taylor-Maclaurin Coefficients has a difficulty with coefficients. |an|, (n ∈ N 1, 2; N = 1, 2, 3...) is still an unresolved issue. Numerous studies (see [6,7,11,14,16,17]) have lately created and examined a number of intriguing subclasses of the bi-univalent function class sum and they have discovered non-sharp estimates on the first two Taylors-Macularin coefficients |a2|and −a3| using the $I_{a,b,c}$ Hohlov operator. The function class $\sum$ has the following two new subclasses, which we now introduce."

The second kind of (p,q)- Chebyshev polynomials' recurrence relation is given by

$$\mathrm{U}_n(x, s, p, q) = (p^n + q^n)xU_{n-1}(x, s, p, q) + (pq)^{n-1}sU_{n-2}(x, s, p, , q) \quad (1.10)$$

The recurrence relation in (1.10) has the following specific situations, according to careful observation

$1.u_n(\frac{1}{2}, s, p, q) = F_n(x, s, p, q)$ is the (p,q)- Fibonochi series.
$2.u_n(x, -1, 1, 1) = u_n(x)$ is the second kind Chebyshev polynomial.
$3.u_n(\frac{x}{2}, 1, 1) = F_{n+1}(x)$ is the Fibonochi polynomials.
$4.u_n(\frac{1}{2}, 1, 1) = F_{n+1}$ is the Fibonochi numbers.
$5.u_n(x, 1, 1, 1) = P_{n+1}(x)$ is the pell polynomials.
$6.u_n(1, 1, 1, 1) = P_{n+1}(x)$ is the pell numbers.
$7.u_n(\frac{1}{2}, 2y, 1, 1) = J_{n+1}(y)$ is the Jacobsthal polynomials.
$8.u_n(\frac{1}{2}, 2, 1, 1) = J_{n+1}$ is the Jacobsthal numbers.

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

The generating function for the Gegenbauer polynomials is given by where α is a non-zero real constant.

$$G_\alpha(x,z) = \frac{1}{(1-2xz+z^2)^\alpha} \tag{1.11}$$

where x ∈ [−1, 1] and z ∈ Δ.For a fixed x, the function Gα is analytic in Δ so it can be expanded in a taylor's series as

$$G_\alpha(x,z) = \sum_{n=0}^{\infty} V_n^\alpha(x) z^n \tag{1.12}$$

where V α(x) is known as the Gegenbauer polynomials of degree n.
Since it is obvious that Gα produces nothing when α = 0, the Gegenbauer polynomial's generating function is set to

$$G_0(x,z) = 1 - log(1-2xz+z^2) = \sum_{n=0}^{\infty} V_n^\alpha(x) z^n \tag{1.13}$$

The Gegenbauer polynomials can as will be defined by the relation

$$V_n^\alpha(x) = \frac{1}{n}[2x(n+\alpha-1)V_{n-1}^{\ \alpha}(x) - (n+2\alpha-2)V_{n-2}^{\ \alpha}(x) \tag{1.14}$$

"It results in some values initially stated as

$$V_1^\alpha(x) = 2\alpha x_1$$
$$V_2^\alpha(x) = 2\alpha(1+\alpha)x^2 - \alpha$$

See [18,20,23,31,32] for more information. Note that from (1.11), if α = 1, we obtain the second kind of Chebyshew polynomials, and if α = 1, we get the legendre polynomials. It is intriguing to learn that the recurrence relation can generalise (1.14).

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

$$V_n^{\alpha}(x,s,p,q)=\frac{1}{n}[(p^n+q^n)x(n+\alpha-1)V_{n-1}^{\alpha}(x,s,p,q)+(pq)^{n-1}s(n+2\alpha-2)V_{n-2}^{\alpha}(x,s,p,q) \quad (1.15)$$

Where s is an arbitrarily variable and $0 \le q \le p \le 1$, its initial values are provided by

$$\begin{aligned} V_0^{\alpha}(x,s,p,q) &= 1 \\ V_1^{\alpha}(x,s,p,q) &= \alpha(p+q)x \\ V_2^{\alpha}(x,s,p,q) &= \tfrac{1}{2}[\alpha(1+\alpha)(p^2+q^2)(p+q)x^2+2\alpha pqs] \end{aligned} \quad (1.16)$$

We point out that the (p,q) Gegenbauer polynomials in (1.16) are what we use to obtain the (p,q)-Legendre polynomials for α = 1 after carefully varying the involving parameters. Demonstrate that we will receive the polynomials stated in remark 1.1."

Definition and Lemmas

"The following lemmas are true to support our findings.

Lemma 2.1. *([30]) Let $c(z) \in \Delta$, then $|c_n| \le 1$ for all $n \in N$. Equality occurs for functions $c(z) = e^{iv}z^n (v \in [0, 2\phi))$*

Lemma 2.2. *([19])Let $c(z) \in \Delta$, then for $\sigma \in C$,*
$|c_2 + \sigma c_1^2| \le Max1; |\sigma|$.
Equality holds for functions $c(z) = z$ or $c(z) = z^2$.

Lemma 2.3. *(see[13]) If $h \in P$, then $|c_k| \le 2$ for each k, Where P is the family of all functions h, analytic in U, for which*
$Rh(z) > 0, (z \in U)$
where
$h(z) = 1 + c_1 z + c_2 z^2 + ...(z \in U)$"

Main Results

Unless otherwise stated, all the parameters in what follows should be as stated in sec- tion 3. As a result, these are the established results

Theorem 3.1. *Let $f \in B$ be a member of BS(s,t,G). Then*

$$a_2 = \frac{V_1^3(c_2+d_2)}{2\varphi_2^2(\lambda(\lambda-2)V_1^2-(2-\lambda)^2V_2)+2V_1^2(3-\lambda)\varphi_3}$$

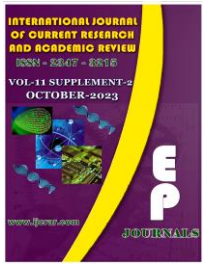
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



and

$$|a_3 - \mu a_2^2| \leq \begin{cases} \frac{V_1^3(\mu-1)}{\varphi_2^2[\lambda(\lambda-2)V_1^2-(2-\lambda^2V_2]+2V_1^2(3-\lambda)\varphi_3} & |\mu-1| > \delta \\ \frac{V_1}{|3-\lambda|\varphi_3} & |\mu-1| \leq \delta \end{cases} \quad (3.1)$$

where

$$\delta = \frac{\varphi_2^2(\lambda(\lambda-2)V_1^2 - (2-\lambda)^2V_2) + 2V_1^2)(3-\lambda)\varphi_3}{(3-\lambda)\varphi_3}$$

Proof. Let f ∈ B be a member of BS(s,t,G). Then there exists the analytic function

$$\frac{z\,[I_{a,b\,,c}\,f(z)]'}{(1-\lambda)z + \lambda I_{a,b\,,c}\,f(z)} = G_{p,q}\,(x, c(z)), z\epsilon\Delta$$

and

$$\frac{w\,[I_{a,b\,,c}\,g(w)]'}{(1-\lambda)w + \lambda I_{a,b\,,c}\,g(w)} = G_{p,q}\,(x, d(w)), w\epsilon\Delta$$

where
$c(z) = c_1z + c_2z^2 + c_3z^3 + \ldots$
and
$d(w) = d_1w + d_2w^2 + d_3w^3 + \ldots. \in \Delta$
Using

$$(2-\lambda)\varphi_2 a_2 = V_1c_1 \quad (3.2)$$

$$-\lambda(2-\lambda)\varphi_2^2a_2^2 - (\lambda-3)\varphi_3a_3 = V_1c_2 + V_2c_1^2 \quad (3.3)$$

$$-(2-\lambda)\varphi_2a_2 = V_1d_1 \quad (3.4)$$

and

$$\lambda(\lambda-2)\varphi_2^2a_2^2 + (3-\lambda)\varphi_3(2a_2^2 - a_3) = V_1d_2 + V_2d_1^2 \quad (3.5)$$

From (3.1) and (3.3), We have

$$c_1 + d_1 = 0$$

$$c_1^2 = d_1^2 \quad (3.6)$$

Also,If We add the Squares of (3.1) and (3.3), we get

$$2(2-\lambda)^2\varphi_2^2a_2^2 = V_1^2[c_1^2 + d_1^2]$$

$$2(2-\lambda)^2\varphi_2^2a_2^2V_1^2 = c_1^2 + d_1^2 \quad (3.7)$$

Likewise (3.2) and (3.4)

$$2\lambda(\lambda-2)\varphi_2^2a_2^2 + (3-\lambda)\varphi_32a_2^2 = V_1(c_2+d_2) + V_2(c_1^2+d_1^2) \quad (3.8)$$

and putting (3.6) in (3.7) we get

$$a_2^2 = \frac{V_1^3(c_2+d_2)}{2\varphi_2^2[\lambda(\lambda-2)V_1^2 - (2-\lambda)^2V_2] + 2V_1^2(3-\lambda)\varphi_3}.$$

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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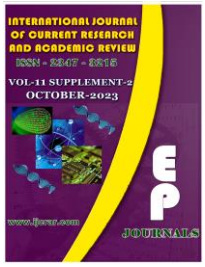

so that using (1.16), taking modulus of boyh sides and applying lemma 2.1 give the results. Now if subtract (3.2) and (3.4), we get

$$a_3 = \frac{\alpha(p+q)x(c_2+d_2)}{2(3-\lambda)\varphi_3} + \frac{\alpha^2(p+q)^2x^2(c_1^2+d_1^2}{2(2-\lambda)^2\varphi_2^2} \tag{3.9}$$

Let $\mu \in R$then in view of (3.8) and noting that

$$a_3 - \mu a_2^2 = (1-\mu)a_2^2 + (a_3 - a_2^2),$$

$$a_3-\mu a_2^2 = \frac{(1-\mu)V_1^3(c_2+d_2)}{2\varphi_2^2[\lambda(\lambda-2)V_1^2-(2-\lambda)^2V_2]+2V_1^2(3-\lambda)\varphi_3}+\frac{V_1(c_2+d_2)}{2(3-\lambda)\varphi_3}+\frac{V_1^2(c_1^2+d_1^2)}{2(2-\lambda)^2\varphi_2^2}-\frac{V_1^3(c_2+d_2)}{2\varphi_2^2[\lambda(\lambda-2)V_1^2-(2-\lambda)^2V_2]+2V_1^2(3-\lambda)\varphi_3} \tag{3.10}$$

$$|a_3 - \mu a_2^2| \leq \begin{cases} \frac{V_1^3(\mu-1)}{\varphi_2^2[\lambda(\lambda-2)V_1^2-(2-\lambda^2V_2]+2V_1^2(3-\lambda)\varphi_3} & |\mu-1| > \delta \\ \frac{V_1}{|3-\lambda|\varphi_3} & |\mu-1| \leq \delta \end{cases} \tag{3.11}$$

where

$$\delta = \frac{\varphi_2^2(\lambda(\lambda-2)V_1^2-(2-\lambda)^2V_2)+2V_1^2)(3-\lambda)\varphi_3}{(3-\lambda)\varphi_3}$$

(p,q) wanas operator.

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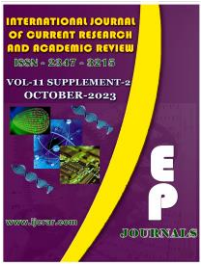

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EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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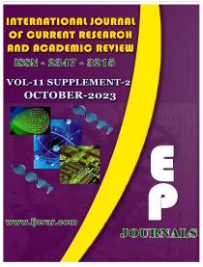

Full Length Article **IJCRAR/FL/63**

Review Article: Semecarpus anacardium – Marking Nut

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Abstract

Our knowledge of plants in our environment is far from complete. Medicinal plants and human beings have unique relationship since time immemorial. Fossil records date the use of plants as a source of medicine to the Palaeolithic age around 60,000 years ago (Fabricant and Farnsworth, 2001). Traditional system of medicine shows that plants have provided mankind large variety of patented drugs to cure various diseases. The drugs used in the traditional system of medicine are all crude drugs in their natural states or as their preparations. The crude drug thus, acts as a single chemical agent without any or much side effects unlike synthetic drugs. The demand for herbal medicines continuously increased due to their lesser side effects when compared with synthetic drugs. The plant Semecarpus anacardium has long been used in Ayurveda system of medicine. The nuts of this plant commonly known as "Marking nut" is used as a dye and also as a medicinal product by traditional healers.

Keywords: Medicinal plants, drugs, medicine Semecarpus anacardium, Anacardiaceae.

Introduction

Semecarpus anacardium Linn. (Family: *Anacardiaceae*) is distributed in sub-Himalayan region, tropical and central parts of India. The nut is commonly known as 'marking nut' and in the vernacular as 'Ballataka' or 'Bhilwa'. It has high priority and applicability in indigenous system of medicine. *Semecarpus anacardium* Linn. (Family: *Anacardiaceae*) is a plant well-known for its

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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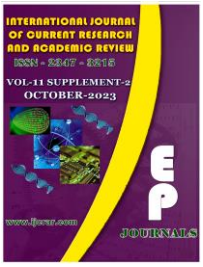


medicinal value in Ayurvedic and Siddha system of medicine. Chemical and phytochemical analyses of its nut reveal the presence of biflavonoids, phenolic compounds, bhilawanols, minerals, vitamins and amino acids. A variety of nut extract preparations from this source are effective against many diseases, viz., arthritis, tumors, infections and so on. However, the mechanism of the pharmacological action of its nut can be greatly aided by the isolation of its active principle and determination of structure-function relationship.

Semecarpus anacardium (SA) linn (Family: *Anacardiaceae*) is distributed in sub-Himalayan region, tropical and central parts of India. The nut is commonly known as marking nut and in the vernacular as `Ballataka' or `Bhilwa'. *Semecarpus* has long been used in Ayurveda. The tree produce sap which dries to a black resin and this has been mixed with lime or alum and used as a dye or marking ink (hence the name). Trade in the bhilawa nut is ancient and this fruit is considered to be the golden acorn of Galen and Avicenna.

Habitat

The tree is distributed throughout the hotter parts of India and in the deciduous forests of the Malaysian archipelago and northern Australia.

Botanical Distribution

It is a moderate-sized deciduous tree found in the outer Himalayas and hotter parts of India up to 3500 ft. height. The plant is found in abundance in Assam, Bihar, Bengal and Orissa, Chittagong, central India and western peninsula of East Archipelago, Northern Australia.

It is a medium-to-large size tree, 15-25 m in height with grey bark exfoliating in small irregular flakes, leaves simple alternate, obviate - oblong, 30-60 cm long and 12-30 cm broad, rounded at the apex coriaceous glabrous above and more or less pubescent, beneath. The flowers are greenish white, in panicles and appear with new leaves in May and June, easily recognized by large leaves and the red blaze exuding resin, which blackens on exposure. The nut is about 2.5 cm long, ovoid and smooth lustrous black. It is frequently found in drier rather than damp localities. The fruit ripens from December to March and are 2-3 cm broad. It has no specific soil affinity. It is a

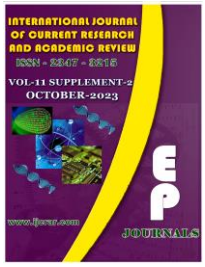
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



moderate shade bearer, obliquely ovoid or oblong drupe, 2.5 to 3.8 cm long, compressed, shining black when ripe, seated on an orange-colored receptacle form of the disk, the base of the calyx and the extremity of the peduncle. The bark is grey in color and exudes an irritant secretion on incising.

Parts Used

Fruit, gum and oil.

Traditional and Modern Use

The resinous juice can be applied to heel cracks. In traditional medicine, it is highly valued for the treatment of tumors and malignant growths. The fruit is reported to be caustic, astringent, alterative, antiheamatic, carminative, counterirritant, rubefacient and vesicant. It is also used in anorexia, cough, asthma, and indigestion, enlargement of the spleen, alopecia, ulcers, corns, leprosy, leucoderma, rheumatism, piles and for various nervous diseases.

Ethnoveterinary Usage

The crushed seeds are applied to cuts, bruises and scratches to stop bleeding. The oil is applied to cracks and fissures in the tails and hooves of animals. Bhilawa fruits are cooked in mustard oil and then applied to sores to kill maggots.

Major Chemical Constituents

Phenolic Compounds

The seed contains anacardoside and other derivatives of anacardic acids including 'bhilawanol' which is a mixture of 1, 2, dihydroxy-3-(pentadecenyl_S`) benzene and 1, 2,-dihydroxy-3-(pentadecadienyl-S`, 11`) –benzene.

Fixed Oil

The oil from the nut contains palmitic, stearic, oleic, linoleic and arachidic acids.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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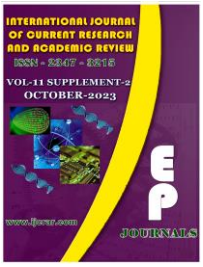


Classical Use

Detoxified nut of Bhallaataka (SA) were incorporated in prescriptions for toxic conditions, obstinate skin diseases, tumors, malignant growths, fevers, haemoptysis, excessice menstruation, vaginal discharge, deficient lactation, constipation, intestinal parasites.(Charaka, Sushruta). Bhallaataka (SA), Hartaki (*Terminalia chebula*) and Jiraka (*Cuminum cyminum*), mixed with jaggery and made into a sweet bolus, were administered in splengomegaly. (*Vrinda maadhava*). A decoction of bruised fruit (1 to 8) in a dose of 25ml was given for asthma. A decoction with milk and purified butter, in gradually increasing doses, was given in peripheral neuritis, sciatica, facial paralysis, hemiplegia. Bhallaataka vardhamanna (*Vrinda maadhava*) was used as a nervine tonic. Nuts boiled with 1.25L milk were given as aphrodiasic. (*Ashtaanga sangraha*).

Bhallaataka rasayana of charaka was prescribed as a potent rejuvenating tonic. Purified butter, cooked with the paste and decoction of nut, mixed with sugar, was administered for treating tumors (Chakradatta). Bhallaataka oil, mixed with vidanga (*Embelia ribes*), was also used. (Ashtaanga Hridaya, Gadanigraha, Siddha-bheshaja-manimaala). Juices of the pericarp and the oil of Bhallaataka are powerful escharotics; used in Indian medicine in small doses (0.03 – 0.06cc diluted with clarified butter, cream or honey ten times its volume). The oil of Bhallaataka, mitigated with butter or mustard oil in which the fruits of Bhallaataka are fried, is used internally. Ripe fruits, boiled with a solution of cow-dung, are used internally. Nuts are used only after curing under medical supervision.

In alternative medicine, medicinal plants preparations have found widespread use particularly in the case of diseases not amenable to treatment by modern methods. Eventhough *Terminalia chebula* and *Semecarpus anacardium* are extensively used in Ayurveda, Unani and Homoeopathic medicines their immunomodulatory, antitumour, wound healing and other such important properties are not yet explored.

Antioxidant Activity

Semecarpus anacardium has been reported in various studies to possess potent antioxidant activity. Verma *et al.,* (2008) investigated antioxidant activity of the aqueous extract of nuts of medicinal

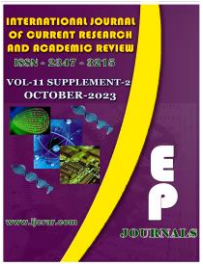
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



plant SA in AKR mouse liver during development of lymphoma. Administration of the aqueous extract of SA to lymphoma-transplanted mouse leads to increase in the activities of antioxidant enzymes, whereas LDH activity is brought down significantly indicating a decrease in carcinogenesis.

Sahoo *et al.,* (2008) investigated the antioxidant activity of ethyl acetate extract of stem bark of SA. Ethyl acetate extract showed the stronger antioxidant activity (due to presence of highest total phenolic content of 68.67% measured as pyrocatechol equivalent) compared to the other (hexane, chloroform and methanol) extracts. The isolation of the ethyl acetate extract of SA stem bark yielded a bright-yellow solid crystal, which was identified as butein. This compound exhibited antioxidant activity (IC50 values of 43.28±4.34 µg/ml), which was comparable to rutin taken as a standard.

Antimicrobial Activity

Mohanta *et al.,* (2007) prepared the aqueous and organic solvent extracts of the plant and screened for antimicrobial (disc diffusion method) and phytochemical properties. The petroleum ether (PEE) and aqueous extract fractions (AQE) showed inhibitory activity against *Staphylococcus aureus* (10 mm) and *Shigella flexneri*> (16 mm) at 100 mg/ml, respectively. While chloroform extract showed inhibition against *Bacillus licheniformis*, *Vibrio cholerae* and *Pseudomonas aeruginosa*, the ethanol extract showed inhibition to *Pseudomonas aeruginosa* and *S. aureus*. Nair *et al.,* (1996) found that the alcoholic extract of dry nuts of SA (Bhallatak) showed bactericidal activity *in vitro* against three-gram negative strains (*Escherichia coli, Salmonella typhi* and *Proteus vulgaris*) and two-gram positive strains (*Staphylococcus aureus* and *Corynebacterium diphtheriae*). Subsequent studies have shown that the alcoholic extracts of different parts of the plant (leaves, twigs and green fruit) also possess anti-bacterial properties, especially the leaf extract. No dermatoxic effect (irritant property) was observed in the mouse skin irritant assay.

Anti-Carcinogenic Activity

Mathivadhani *et al.,* (2007) studied SA nut extract for inhibitory effect on human breast cancer cells (T47D). Cytotoxicity analyses suggested that these cells had become apoptotic. *Semecarpus*

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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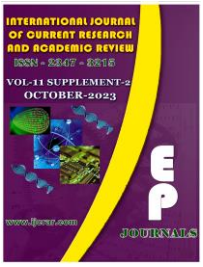
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



anacardium was discovered to induce rapid Ca (2+) mobilization from intracellular stores of T47D cell line, and its cytotoxicity against T47D was well correlated with altered mitochondrial transmembrane potential. At the molecular level, these changes are accompanied by decrease in Bcl(2) and increase in Bax, cytochrome C, caspases and PARP cleavage, and ultimately by internucleosomal DNA fragmentation. Taken together, our results provide unprecedented evidence that SA triggers apoptotic signals in T47D cells (Veena *et al.,* 2006)

Arulkumaran *et al.,* (2007) investigated the protective efficacy of preparation named as Kalpaamruthaa (KA) (includes SA nut milk extract, dried powder of *Phyllanthus emblica* fruit and honey) on the peroxidative damage and abnormal antioxidant levels in the hepatic mitochondrial fraction of 7,12-dimethylbenz(a)anthracene (DMBA)-induced mammary carcinoma rats.

DMBA-treated rats also showed decline in the activities of mitochondrial enzymes. In contrast, rats treated with SA and KA showed normal lipid peroxidation antioxidant defenses in mitochondrial enzymes, and indicate the anticarcinogenic activity of KA during DMBA-initiated mammary carcinogenesis. On the basis of the observed results, KA can be considered as a readily accessible, promising and novel cancer chemopreventive agent.

Sugapriya *et al.,* (2008) showed restoration of energy metabolism in leukemic mice treated by SA nut milk extract. Leukemia-bearing mice showed a significant increase in LPOs, glycolytic enzymes, a decrease in gluconeogenic enzymes and significant decrease in the activities of TCA cycle and respiratory chain enzymes as compared to control animals. *Semecarpus anacardium* treatment was compared with standard drug imatinib mesylate. *Semecarpus anacardium* administration to leukemic animals resulted in clearance of the leukemic cells from the bone marrow and internal organs.

Conclusion

The present review clearly indicates that the extracts of the nuts of *Semecarpus anacardium* have valuable bioactive compounds. Further clinical studies and characterization of the particular compound of pharmacological interest in the secondary metabolites will be of great help to develop novel drugs.

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International Journal of Current Research and Academic Review

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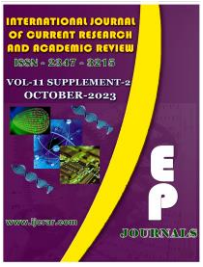

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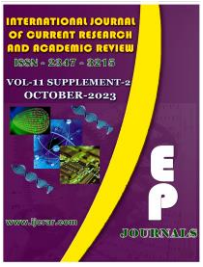

Full Length Article **IJCRAR/FL/64**

Ethical Artificial Intelligence in Education

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Abstract

Artificial intelligence reforms the world, so numerous impacts and benefits make it veritably useful in the forthcoming future to study AI deeply and develop technology using AI. In the future, when so numerous people use AI, it'll be easy to concentrate on studies without dubieties, and the delicate education system will know the AI ethics pedagogy. AI ethics only benefits impact, it can reform the world, and it goes on the whipper way. This study is about the mortal and ethical issues inferred in the use of AI in education. AI has been playing a significant part in the field of health care, but at the same time, it has numerous ethical challenges. The future of our ultramodern age is our evidence belief in technology in all walks of life, no minimum in education that this desire with technology or hacker in education has a deep impact on our classroom to change the relationship between schoolteacher and pupil, and also that these relations have come stingier because of the reduced capacity to form bonds and the reduced position of bond between schoolteacher and pupil. AI used in advanced education tools is to supply customized intervention and feedback from the pupil's point of view. This paper reveals scholar's opinion that AIED (artificial intelligence in education) may disrupt aspects of the pedagogical geography similar as learner autonomy, learning surroundings and approaches to pedagogical rules.

Keywords: Ethical AI, Privacy, Transparency, Accountability, Technology, Bias and discrimination, Pedagogical, Learner autonomy.

Introduction

Artificial intelligence is spreading more around the world. The technology education of AI is also reaching the world. AI is getting expansive these days. Using AI has given so numerous benefits, like substantiated literacy, task robotization, customized data- grounded feedback, etc. Ethics

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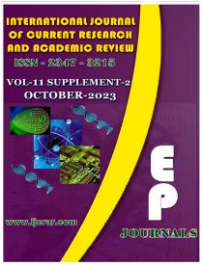

guidelines, enforcing ethical education and mindfulness, and strengthening ethical governance and regulation they ensure that AI in education works for the good of humanity, society, and the terrain. With the help of ethical AI technology, which replicates mortal intelligence to make deductions, judgments, and prognostications, computer systems can give guidance and support feedback to scholars in making opinions.

AIED (artificial intelligence in education) is the primary exploration focus in the field of computer and education moment. AI has been applied to colorful aspects, similar as visual and voice recognition, decision- timber, natural language processing, and restatement between languages in terms of computer program operation.

Artificial intelligence (AIED) (artificial intelligence in education) is getting popular for perfecting tutoring and literacy. For case, analytics- grounded tools and adaptive technologies have been used to give tailored recommendations to meet individual requirements. The specialized community aspires to remodel functionality and address established technology. At times, AIED itself is responsible for each of its issues. AI spreading more the technology also reaching AI in Education can raise the various ethical issues such that data production and privacy, bias and discrimination autonomy and agency, transparency and explain ability and accountability.

Literature Review

Jason Borenstein, Ayanna Howard [1] has presented. The challenges emerging in relation to AI cross over disciplinary lines and are too complex for any single type of expertise to handle. Another key facet of AI ethics education is cultivating critical thinking and ethical reasoning skills in students that are transferable across different professional contexts. AI provides observable benefits, the collection, use, and abuse of data used to train and feed into AI, as well as the algorithm itself, may expose people to risks that they were not even aware existed.

Andy Nguyen, Ha Ngan Ngo, Yvonne Hong, Belle Dang, Bich-Phuong Thi Nguyen [2] has described that the intricacy of AI necessitates a holistic and applicable set of ethical principles for AI in the educational context. The concept of explainability in AI and data is closely linked to the

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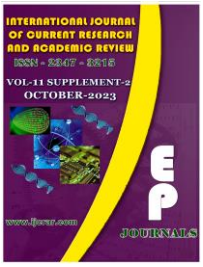

transparency of the AI system and data generated. Indeed, data should feature the ability to explain some predictions from a technical viewpoint of a particular human.

Judy Goldsmith, Emanuelle Burton, David M. Goldstein, Shannon Sampson Dueber, Beth, Michael D. Toland [3] has proposed that the push toward teaching AI ethics comes out of a profound understanding that ethical design and analysis of AI is necessary for global social welfare, a plea for the teaching of open-ended, description-oriented AI ethics, and a plea for cooperation in the development of assessment tools to measure the effectiveness of our teaching of ethical teaching of AI. The domain of ethical reasoning capacity can be seen as consisting of two facets or domains: ethical description and felt ethical responsibility. The relationship between these two domains is complex.

Bingyi Han, Sadia Nawaz, George Buchanan, Dana McKay [4] has described that the Instructors and learning designers should not overlook students' interaction with the changed learning environment. The education landscape should be considered as a whole: including not only students and educators, but also all changes brought to students' behaviors, status, and the educational system. Automated systems should respect differences and provide flexibility and control to mitigate concerns due to varying students' expectations and needs, so that to encourage the acceptance towards AIED-afforded personalized learning.

Various Ethical Issues

Bias and Discrimination

AI system may use data that is incomplete or they may apply algorithms that are not transparent their decision.

Data Production and Privacy

AI system collect data, store, process and share large amount of personal and sensitive data from student and teachers such as academic performance, behaviour, preverence emotion, bio metric or health information. The privacy and data production right such as survielenace.

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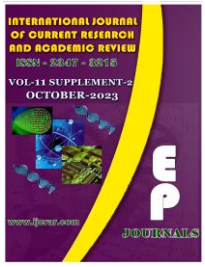

Autonomy and Agency

AI system may provide recommendation or feedback not aligned with the learner goals, interact or values they replace human interact and guidance response.

Accountability and Responsibility

AI may ask queries to the design, development, deployment use or impact in education AI system may affect or error that are not specific human agent.

Benefits of Ethical AI in Education

Personalized Learning

AI can analyse each student's learning style, pace, and strengths and weaknesses to create personalized learning experiences. This tailored approach helps students grasp concepts more effectively and at their own speed.

Adaptive Learning

AI-powered educational platforms can adapt content and difficulty levels in real-time based on a student's performance. This ensures that students are appropriately challenged and not overwhelmed or bored.

Instant Feedback

AI can provide immediate feedback on assignments and assessments, allowing students to understand their mistakes and make corrections promptly, which enhances the learning process.

Automating Administrative Tasks

AI can automate administrative tasks such as grading, scheduling, and record-keeping, freeing up teachers' time to focus on more meaningful interactions with students.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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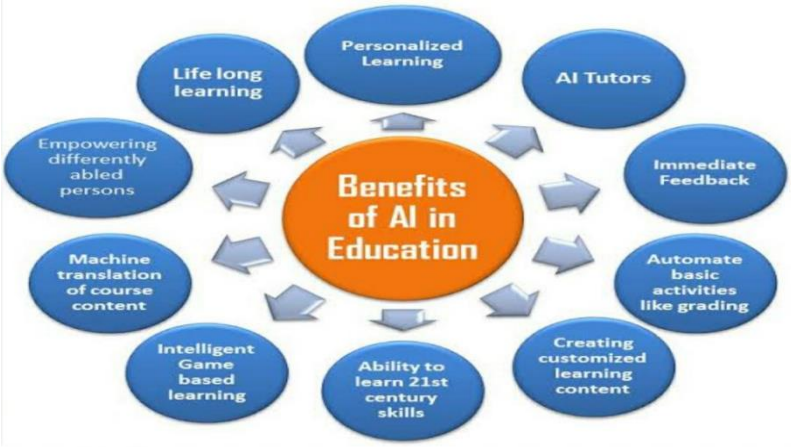
Language Learning and Translation

AI-powered language learning apps and translation tools help students learn new languages more efficiently and communicate with people from diverse backgrounds.

Cost Efficiency

Automation through AI can reduce administrative costs, making education more affordable and accessible. The benefits of AI is shown in fig1.

Fig.1 Benefits of AI



Pro's and Con's

Pro's

Efficiency

AI can automate administrative tasks, such as grading and scheduling, allowing educators to focus more on teaching and mentoring students.

International Journal of Current Research and Academic Review
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Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Data-Driven Insights

AI can analyze vast amounts of data to provide educators with insights into student performance and areas where additional support is needed. This data-driven approach can inform instructional strategies.

24/7 Availability

AI-powered chatbots and virtual tutors can be available around the clock to assist students with their questions and concerns, promoting continuous learning.

Cost Savings

By automating tasks and providing scalable support, AI can potentially reduce educational costs.

Con's

Privacy Concerns

AI systems can collect and store sensitive student data, raising concerns about privacy and data security. There's a risk that this data could be misused or breached.

Bias and Fairness

If not carefully designed and monitored, AI algorithms can perpetuate biases present in the data they are trained on, potentially leading to discrimination or unfair treatment of certain groups of students.

Loss of Human Connection

While AI can provide valuable support, it cannot fully replace the human touch in education. Students may miss out on the interpersonal relationships and mentorship that teachers offer.

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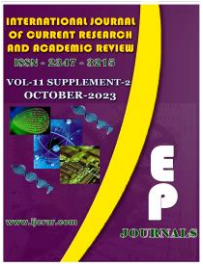

Lack of Regulation

The field of AI in education is relatively new, and there is a lack of standardized regulations and guidelines. This can lead to inconsistent practices and the potential misuse of AI.

Conclusion

An assessment will allow experimenters to study the efficiency of different approaches to tutoring computer ethics. Once scholars perceive LA (learning analytics) backing as effective for problem working, established relations among scholars will be reduced. This might covertly lessen their pedagogical connections with peer literacy. LA (learning analytics) supported literacy surroundings should produce spaces for easing mortal connections (in the classroom) by enhancing mortal commerce.

Although at most of us at AAAI (association for the advancement of artificial intelligence) don't have the educational and psychometric backgrounds demanded to design effective ethical thinking assessment tools, In this work do have moxie in AI and a growing mindfulness of the necessity of ethical thinking about AI. While AIED strives to enhance positive educational issues, it also raises enterprises regarding the unintended ethical impacts on scholars' well- being and learning gests.

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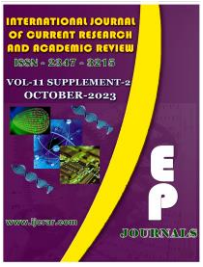

Full Length Article **IJCRAR/FL/65**

An Analysis of AI-Based Virtual Assistants and their Applications

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Abstract

This paper focuses on the effective and secure use of AI-based virtual assistants, which are currently a hot topic. If we incorporate AI into VA, it will undoubtedly be more effective, and many industries, including education, cars, healthcare, home care, finance, and marketing, are using VA to increase their potential. It is clear that this technology will soon be used everywhere, and with the introduction of 5G and advancements in machine learning, it will only get better. In addition to these uses, we want to use virtual assistance safely so that we can get more use out of them. In the healthcare industry, virtual assistance is used to assist the disabled, in education to keep students on track, in cars to allow drivers to drive tension-free, and in the teaching profession as a teacher's assistant.

Keywords: Virtual Assistant, Artificial Intelligence, Self-driving automobiles, Chatbots.

Introduction

In today's technology age, a lot of people use virtual assistants to help them with various tasks. As the phrase implies, a virtual assistant is an assistant who works virtually, meaning they are not physically present at work. Virtual assistants frequently work from home or a distant place, providing them a great deal of freedom in terms of their schedule and setting. Virtual assistant demand is growing! Artificial intelligence (AI) technology has greatly expanded the acceptance of computers that simulate human interaction and perform a variety of tasks. Google Assistant,

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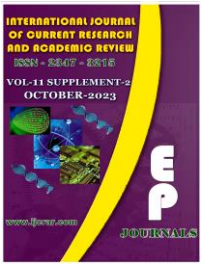

Microsoft's Cortana, Apple Siri, and Amazon Echo are all well known. However, in a number of industries, like education, healthcare, and home, other incredible real-world uses are gaining popularity. Due to growing tendencies towards outsourcing labor, a mobile workforce, and a focus on consumer involvement, home care and self-driving cars are on the rise. Virtual assistants use AI and machine learning to detect our speech, respond to our requests, and take control of our homes thanks to their connectivity with devices like air conditioners, lightbulbs, microwaves, and washing machines.

A virtual assistant is a common service to engage with users by voice command in the Internet of Things environment. The use of artificial intelligence also marked a turning point in the development of VAs. The ability of the VAs was greatly increased by using AI in their development. VAs now use a restricted set of AI capabilities. However, adopting general AI in the near future may revolutionize how VA services are provided.

Literature Review

Alex Mari, *et al.,* [1] Propose that The company level dependence on virtual assistant with consumers' likelihood of purchasing using commands has updated thanks to virtual assistant and it has opened a door for marketers the three key driver shop adaptation of voice-based marketing and sales initiatives into their current communication. Due to COVID-19, there are more products available, they are more convenient to shop for, and they are better value for money. This technology has advanced more quickly than in earlier decades as a result of the social dissenting case.

K.H. Yusof, *et al.,* [2] Says that A Virtual assistant is created that can be awakened by utilizing the wake worth, as uses for it are presented in this paper. Jarvis The virtual assistant lets the user order tasks and ask questions so that the task can be completed, such as opening an app and playing music. If no one is around, the VA will turn itself off using motion sensors.

Matthias Handrich, *et al.,* [3] recognized that the use of the IPA in today's world of smartphones and smartwatches, but only 50% of users are fully utilizing it. To address this issue, the author

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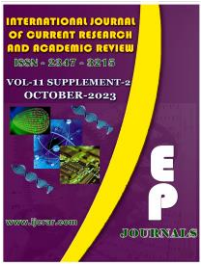

conducted a thorough survey. The worrying factors are individual differences in data privacy, trusted AI, and creepiness, which results in innovative resistance.

Ujjwal Gupta, *et al.,* [4], sighted that reliance on automation in this article, the authors constructed a desktop VA using Python because it has a vast library and can be used to carry out commands. It helps with basic activities like streaming music, searching Wikipedia, and opening desktop applications

Samiksha Gaikwad, *et al.,* [5] Says that.There are numerous libraries and books available nowadays, thus IVA is employed to preserve them, making the environment for users more convenient.

Harry Barton Essel, *et al.,* [6] Determined that other amazing real-world applications are gaining attraction in a variety of sectors, including education, healthcare, home care, and self-driving automobiles, as a result of expanding trends towards outsourcing labor, a mobile workforce.

Jing Liu, *et al.,* [7] explained that since voice assistants and high levels of automation are becoming more common in automobiles thanks to information and communication technology, drivers of electric vehicles with AI-based vas can experience greater independence.

Lukas Paulauskas, *et al.,* [8] propose that when it comes to preserving historical heritage, such as in museums, virtual reality is playing a significant role. It can take the position of humans in explaining historical artifacts, and not just VR and AR, but also VA, are the main draws for visitors and kids alike.

Andreea-Elena Lacraru, *et al.,* [9] Explained that Cardiovascular and Ischemic disease rehabilitation can be effectively provided through a virtual model called telerehabilitation, which allows patients to participate in rehabilitation services at set times from the comfort of their homes.

Jana Surovkava, *et al.,* [10] proved that Treatment planning is one of many trends that AI assistant diagnosis is using; it is not the responsibility of dental assistants or nurses, but rather, it is the most crucial pillar in dent.

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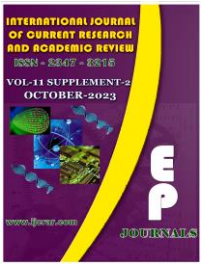

Rabin Joshi, *et al.,* [11] shows that It is a python-based voice assistant this assistant operates as an application and carries out routine duties. Like checking the weather, streaming music, searching Wikipedia, opening desktop programs etc.

Mrs.Patil Kavita Manoj Kumar, *et al.,* [12] shows that It is a python-based voice assistant this assistant operates as an application and carries out routine duties. Like checking the weather, streaming music, searching Wikipedia, opening desktop programs etc. The current system's functionality is restricted to working the application-based data only. Python-best personal virtual assistants for windows have been discussed. Humans' lives are made easier by virtual assistants.al applications. Patients frequently displayed favorable attitudes towards the use of AI in dentistry.

Abd-elmegeid Amin Ali, *et al.,* [13] explained that The Internet of things, sensors, smartphones, smart appliances, and cloud computing have been used recently to transform ordinary homes into smart homes. These smart homes help persons with disabilities enhance their quality of life by remotely controlling the devices via mobile applications or their voices. This research proposes an intelligent personal assistant, called IRON, to help disabled people control their appliances with their voices.

Applications

Virtual assistant for education

Although artificial intelligence (AI) cannot replace human teachers, it can help students learn and is already being incorporated into school systems at both the classroom and institutional levels. Using chatbots to encourage, remind, and provide immediate aid to students to keep them on track is one method that teachers frequently employ AI virtual assistance.

Healthcare and Company

Human life expectancy is rising on a global scale. The need for elder and home care for people who live alone and need daily support is rising as a result of this longer life expectancy. Due to a

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Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

dearth of qualified carers, businesses are creating AI-based digital assistants and companions to offer extra help that can be customized for each patient.

Benefits of a Virtual Assistant for Housekeeping

Virtual assistants use AI and machine learning to detect our speech, respond to our requests, and take control of our homes thanks to their connectivity with devices like air conditioners, lightbulbs, and washing machines, smart ovens, microwaves, and cooktops this guarantees consistency and avoids overcooking or scorching.

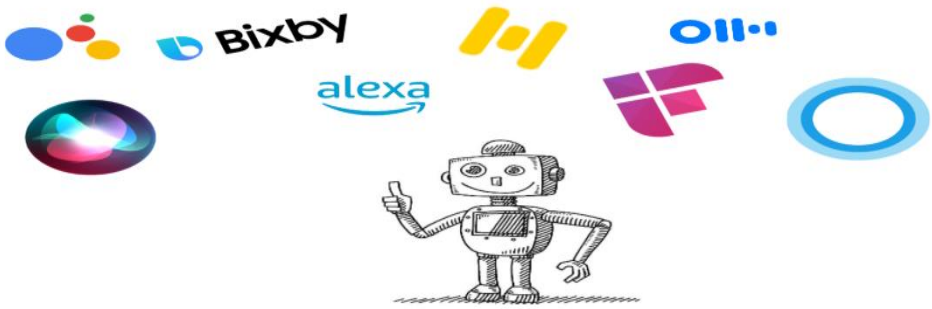
Robotic Rides Have Arrived

Self-driving automobiles are one of the most intriguing applications of AI virtual assistants. Although it may seem incredibly futuristic, robots actually exist today. Self-driving automobiles can analyze their surroundings and navigate on their own using artificial intelligence (AI).

Financial industry uses of virtual assistants

The customer chat assistant is one of the most popular applications of AI in banking. Voice and text are both used by these aides to simulate human conversation. Which allows assistants to learn from user interactions and have what appear to be natural conversations with customers.

Fig.1 Different Brands of Virtual Assistant



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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Pitfalls

Voice assistants ease our lives, but they also have some drawbacks.

Less privacy

Because they run continually, they hear everything we say and may record it.

Access to personal information

In order for them to function, we must grant them access to our email address, contact information, etc.

Familiarity with our habits

They notice much more than just what we ask for and say. They might also obtain information about our routines and the time we get home by extracting data from gadgets that are connected to them.

Identity theft

Despite the fact that we set them to only recognize our voice, there is a chance that hackers will breach them and steal our personal data.

Utilize Virtual Assistants Safely

Learn How it Works

One can access virtual assistants with a "wake word" like "Alexa" can be used to activate some of these devices because they have the ability to listen for particular sound patterns. They might misunderstand what you say and start recording. Because voice assistants frequently record conversations and upload them to the manufacturer's servers, to ensure that your chats with others and your voice assistant remain private and safe.

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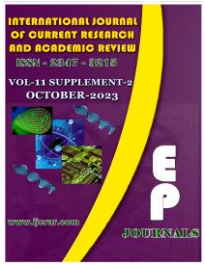

View the Privacy Statement

Manufacturers of voice assistants have occasionally required workers to listen to audio recordings in order to improve the functionality of their products, check the privacy statement for your voice assistant. You might be able to modify your settings so that recordings are not reviewed by humans.

Remove Previous Recordings

You can control how long the manufacturer keeps your voice recordings and even delete older ones.

Secure Your Login

For the app or online account that manages one's voice assistant, create a strong password. Avoid reusing passwords from previous accounts.

Understanding the Accounts Your Voice Assistant has Connected

By turning on "guest mode," onemight also be able to restrict your visitors' access to your information or their ability to make purchases. To see what features your voice assistant's "guest mode" can disable

Conclusion

Voice assistants and search appear to have a promising future. Given the rising use of gadgets that use biometric speaker identification and the amount of people who have already realized how useful those tools may be. It's obvious that technology will soon be everywhere, and with the advent of 5G and advancements in machine learning, voice assistants may eventually turn into indispensable tools.

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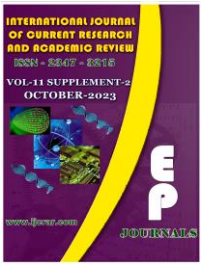

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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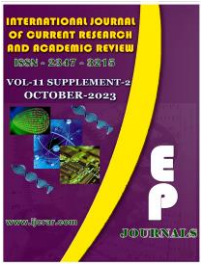

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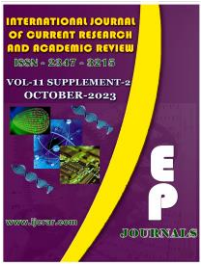

Full Length Article **IJCRAR/FL/66**

Natural compounds as potential inhibitors of Acinetobacter baumanii

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Abstract

Acinetobacter baumanii, a coccobacillus Gram- negative bacteria has been listed by WHO as a critical priority pathogen as it is recognized as an opportunistic pathogen which causes nosocomial infection. The need to find new potential drugs with anti-bacterial properties which can inhibit the growth of A.baumanni is the need of the hour. This review focuses on plant secondary metabolites which is found to effectively curb the growth of the opportunistic bacteria *A.baumanii*.

Keywords: *Acinetobacter baumanii*, plant secondary metabolites, anti-biotic resistance.

Introduction

Acinetobacter baumanni is Gram-negative coccobacillus that is aerobic, non- motile, non-sporulating, pleomorphic. It is an opportunistic pathogen which is prevalent in immunocompromised patient especially those who have had an extended hospital stay. A.baumannii is becoming a more common cause of Hospital-acquired infection (HAI),

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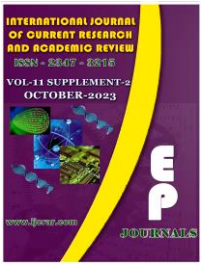

particularly in intensive care units (ICUs)(1). *A. baumannii* was identified and classified as a distinct species in the 1950s and 1960s. It was named after Paul H. Baumann, a microbiologist who made significant contributions to the study of Acinetobacter species. *A. baumannii* gained attention in healthcare settings, particularly in the 1970s and 1980s. It was recognized as an opportunistic pathogen capable of causing infections, especially in critically ill patients in hospitals and intensive care units (2).

Taxonomy

The genus Acinetobacter was classified in the family Moraxellaceae within the order Gammaproteobacteria, which includes the genera *Moraxella, Acinetobacter, Psychrobacter*, and related organisms (3). Beijerinck isolated the pathogen *Micrococcus calcoaceticus* from soil on a calcium acetate-mineral medium in 1911, contributing to the genus Acinetobacter's creation. The genus Acinetobacter was first proposed by Brisou and Prevot (1954) to distinguish the organisms in the tribe "Achromobactereae" based on their motility. It was made up of non-pigmented Gram-negative saprophytic bacteria and included both oxidase-negative and oxidase-positive species(4). In 1986 Bouvet and Grimontproposed, based on DNA-DNA hybridization studies it was distinguished by 12 DNA genomic species within the genus Acinetobacter. Some of which were given formal species names, including *A. baumannii*, A. calcoaceticus, A. haemolyticus, A. johnsonii, A. junii, and A. lwoffii (5). The genus is typically divided into "complexes" by clinical microbiological laboratories, with the ABC (*A. baumannii*-A. calcoaceticus complex) being the most clinically significant. Based on DNA-DNA hybridization experiments, about 25 separate "genomic species" have been found. The second-ranked genomic species is *A. baumannii* (6).

Microbiological Characteristics

A. baumannii are short, plump, non-spore-forming and non-fastidious and can be easily grown on regular laboratory media. These organisms form smooth, sometimes mucoid, grayish white colonies. *A. baumannii* is gram-negative, which means it has a thin peptidoglycan layer surrounded by an outer membrane. Acinetobacter species are strictly aerobic, non-motile, catalase-positive, indole-negative, oxidase-negative, Gram-negative, and citrate-positive (7). It grows well on standard culture media such as blood agar, MacConkey agar, and nutrient agar at

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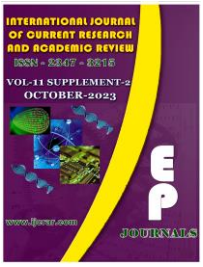

temperatures around 37°C. In blood agar Colonies are 1 to 2 mm, domed, mucoid, and nonpigmented. While in most of the Acinetobacterspp will produce smaller and more translucent colonies. During rapid growth the organism will be typically rod-shaped when it goes to stationary phase it will be cocobacilli and sometime it can be misclassified as gram-positive cocci. *A. baumannii*is not known for its ability to ferment lactose efficiently. As such, it typically appears as non-lactose fermenting colonies on MacConkey agar and the colonies of *A. baumannii* on MacConkey agar are generally colorless, round, slightly raised, translucent or mucoid appearance. (3).

Clinical significance

*A. baumannii*has gathered significant clinical attention due to its growing significance as a nosocomial or hospital-acquired infection. Its clinical significance lies in its ability to cause a wide range of infections, including pneumonia, bloodstream infections, urinary tract infections, and wound infections, particularly in immunocompromised individuals and patients with underlying health conditions (1). Length of hospital stay, surgery, and broad-spectrum antibiotic therapy, urinary or central intravenous catheters left in place, admission to an intensive care unit (ICU), mechanical ventilation, and violations of infection control procedures are all risk factors for nosocomial infections (8).Furthermore, *A. baumannii* can persist in the hospital environment, making it a formidable challenge for infection control measures. Its ability to form biofilms on medical devices and surfaces contributes to its persistence and further complicates eradication efforts.*A. baumannii*'s clinical significance arises from its capacity to cause severe infections, develop resistance to antibiotics, and persist in healthcare settings, posing a substantial threat to patient outcomes and public health (9).

Antimicrobial resistance in A.baumannii

According to WHO, *A.baumannii* is come under the ESKAPE (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *A. baumannii*, *Pseudomonas aeruginosa*, and *Enterobacter spp*) organism which plays a major role in the outbreak of nosocomial infections. Among these 6 organisms, Carbapenem resistance *A.baumannii* (CRAB) is one of the priority organism, which requires combination of antibiotic for treatment. The overall prevalence of multidrug-resistant strains in

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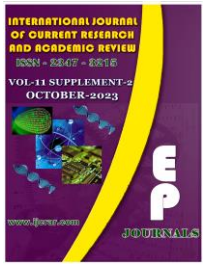

patients with *A. baumannii* in Hospital Associated Pneumonia (HAP) and Ventilator Associated Pneumonia (VAP) differs in various regions across the globe and it is estimated to be 79.9%, ranging from 56.5% in Argentina and 61.8% in Taiwan to 100% in Central America, Pakistan, Lebanon, Qatar, and Croatia, while its overall mortality can be as high as 56.2% 10. A study conducted in 13 different countries to study the resistance pattern of *A. baumannii* showed that the resistance pattern is low in Japan (2.8%) and Australia (6.5%) but it is high in South korea (88%) and India (87.2%) (11).

Mechanism of Antibiotic resistance in *A. baumannii*

Most of the organism possess three groups of antibiotic resistance. Increase in the efflux of the or decreasing the membrane permeability which inhibits the entry of drug into the bacteria. Mutations in the genomic DNA and post translational modification alters the protein structure which help the bacteria to inactivate the antibiotic drug (10). Biofilm formation and survival in the medical devices for prolong period also contribute to the development of resistant to various antibiotics (12). *A. baumannii* produces β lactamases that catalyze the hydrolysis of beta-lactam antibiotics like penicillins, cephalosporins, carbapenems, monobactams, and beta-lactamase inhibitors. *A. baumannii* is nowadays intrinsically resistant to penicillins and cephalosporins [22]. Resistance to beta-lactam antibiotics can be conferred through all the aforementioned mechanisms, which is inactivation by hydrolysis, increase of efflux, decrease of influx, and protection of the antibiotic target.

A. baumannii produces carbapenemase enzyme and the OXA type carbapenemase (mainly OXA-23, OXA-24, OXA-48, OXA-51 and OXA-58) mostly found in the *A. baumannii*. Among these OXA type genes, OXA-51 is intrinsic whether other OXA genes are acquired from other organisms. Apart from this carbapenem gene, New Delhi metallo-β-lactamase (NDM) and *Klebsiellapneumoniae* carbapenemase (KPC) producers have also shown significant importance for worldwide prevalence in the *A. baumannii* strains (13).

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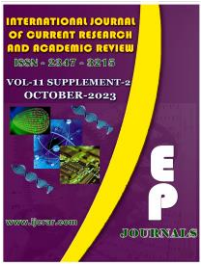

Plant secondary metabolites as potential therapeutic inhibitors

The chemical complexity exhibited by natural products makes them as the starting material for many drug discovery processes. However, the utility of plant metabolites against Multi Drug Resistant (MDR) bacteria has been not considered seriously and is also ignored clinically. Many medicinal chemists claim that natural products are assorted molecules which are capable of interacting with a wide variety of protein molecules to achieve specific goals. Therefore, it can be considered that plant metabolites are valuable resources in the discovery of anti-microbial molecules (14).

Vasudevan *et al*., have reported that Withaferin A and Mangiferin showed highest activity with the enzyme inhibition assay with β- lactamase and NDM-1 enzyme. Apart from the in-vitro assay, in-silico analysis such as molecular docking showed that the above-mentioned compounds exhibited a good Glide score of -5.12 kcal/mol for withaferin A and -6.54 kcal/mol for mangiferin with NDM-1. The above docking results also revealed that the compounds interacted with NDM-1 catalytic amino acids residues through hydrogen bond formation and also hydrophobic interactions (15).

A terpenoid, Withaferin A structure comprises of 4 cycloalkane rings, three cyclohexane rings and a cyclopentane ring. This compound is isolated from Acnistusarborescens and *Withania somnifera* (16).Several reports suggest that this compound possess anti-cancer, adaptogenic, anti-stress anti-convulsant, immunomodulatory, and neurological effects. Also, it has been reported to be a natural proteasome inhibitor, an inducer of apoptosis which inhibits the topoisomerase -I DNA complex and antiangiogenic along with mitotic poison (17). The above study (Vasudevan *et al*.,) reported that (6S)-6-ethyl-3-(hydroxymethyl)-4-methyl-5,6-dihydropyran-2-one region of withaferin A formed hydrogen bond with active site amino acids in NDM-1 indicating this region is important for the biological activity of withaferin A against β-lactamase (15).

Mangiferin is a xanthone is reported to be more prevalent in mango crop (peels, stalks, leaves, barks, kernel and stone). It is found to show anti-oxidant properties with many health benefits which includes antiviral, anticancer, antidiabetic, hepatoprotective and analgesic properties (18). Vasudevan et la., reported that 1,5-anhydroglucitol region of mangiferin formed hydrogen bonds

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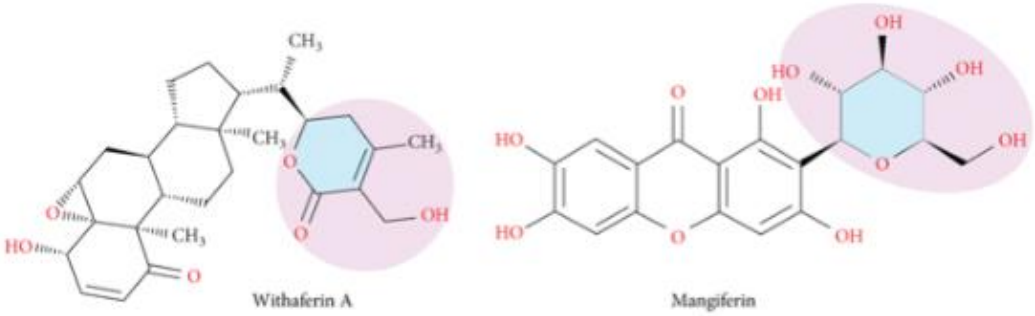
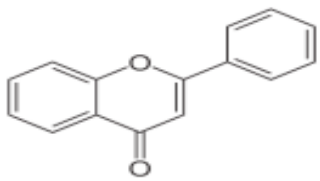
with active site amino acids of NDM-1, indicating the possible biological activity of mangiferin (15).

Figure.1 Structure representing the bioactive moiety of withaferin A and magniferin against β-lactamase (15).



Flavonoids, an important phenolic compound consists of diphenyl propane skeleton and found be predominately present in plants. These are secondary metabolites present along with aglycones, glycosides and methylated derivatives (19). There many reports which highlights the various pharmacological properties of flavonoids which includes anti-cancer, anti-viral and anti-inflammatory activities (20,21). Apart from this, it has been reported to show anti-bacterial activity against a wide range of pathogenic bacteria such as *Staphylococcus aureus* (S. aureus), Vibrioharveyi, Pseudomonas aeruginosa (P. aeruginosa), and Enterococcus faecalis (E. faecalis) (22,23). Inala *et al*., has reported that the flavonoids isolated from Pongamiapinnata seeds were found effective against the drug resistant gram-negative Acinetobacterbaumannii organism (24).

Figure.2 General structure of flavonoids (24)



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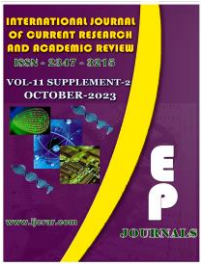

Corilagin (1- acyl-3, 6-hexahydroxy bibenzoyl glucose) has mainly been found in Longan, PhyllanthusurinariaL and Phyllanthusemblica Linn (25, 26). This plant compound is found to show efficacy as anti-cancer agent, anti-cardiovascular diseases such as hypertension, atherosclerosis, congestive heart failure and ischemic cardiomyopathy (27, 28). Epsilon-Viniferin, a phenol compound which belongs to stillbenoids is found mainly in Vitis vinifera, grapevines. With the help of molecular docking tools, Ahmed *et al* has reported that Corilagin and Epsilon-viniferinwere found to bind with Dcap protein with a higher docking score which is responsible for the MDR in A. baumanii. There are many studies which reports the anti-bacterial properties of corilagin and epsilon-viniferin (29, 30).

Conclusion

A. baumaniii considered to be one of the major threats to mankind as its infection leads to higher morbidity and mortality among hospital stay patients. Due to its antibiotic resistance to the currently available drugs as Aminoglycoside, Fluoroquinolone, Tetracycline, etc., its treatment has become a challenge. Hence there is a need for new drugs to combat this situation. Plant secondary metabolites has been gaining importance for this purpose. This review focuses on some of the plant based molecules which has found to be effective against A.baumanii. More clinical studies are required to assess the potential of the above mentioned compounds, so that it can be effectively used in the treatment of A.baumanii.

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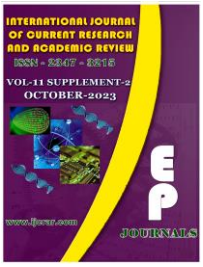

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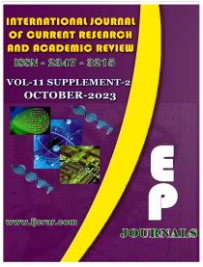

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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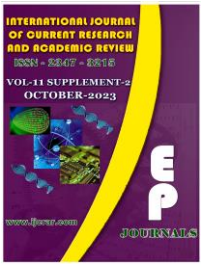

Full Length Article **IJCRAR/FL/67**

Immunomodulatory activity of Terminalia chebula

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Abstract

In the present study immune potentiating activity present in the extracts of *Terminalia chebula*was evaluated. Varying doses of *Terminalia chebula* extract induced a significant increase in neutrophil adhesion when compared to control. Hence, it was found that *Terminalia chebula* causes a stimulation of neutrophils towards the site of inflammation. In the immune suppressed rats by administrating cyclophosphamide the immunity was suppressed but subsequent administration of the extracts of *Terminalia chebula*the functioning of immunity parameters enhanced. In the *Terminalia chebula* treated mice neutrophil and total leukocytes count were found significant increased. This indicates that the numbers of phagocytic cells were increased due to the *Terminalia chebula* treatment. As all the antibodies are immunoglobulin, elevations in the immunoglobulin level indicate a good immune response. In the present study, the treatment of rat with *Terminalia chebula* extract showed a significant increase in the serum immunoglobulin level even after the administration of immunosuppressive drug. The influence of extracts of *Terminalia chebula* on humoral immune response is further fortified by the results of elevated antibody titre in the rats.

Keywords: *Terminalia chebula*, immuno modulator, neutrophil, immune response.

EXCELLENT PUBLISHERS

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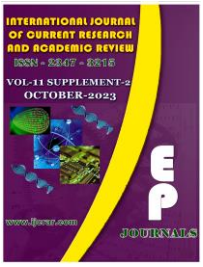

Introduction

Immune system is a remarkable sophisticated defence system in vertebrates, to protect them from invading agents. It is able to generate varieties of cells and molecules capable of recognizing and eliminating limitless varieties of foreign and undesirable agents. Modulation of the immune system denotes to any change in the immune response that can involve induction, expression, amplification or inhibition of any part or phase of the immune response. Thus, immunomodulator is a substance used for its effect on the immune system. There are generally two types of Immunomodulators based on their effects; immuno suppressants and immunostimulators. They have the ability to mount an immune response or defend against pathogens or tumors.

An immunomodulator may be defined as a substance, biological or synthetic, which can stimulate, suppress or modulate any of the components of the immune system including both innate and adaptive arms of the immune response. One of the starting points in the field of immunomodulator has been the search for agents that could be used for the treatment of residual cancer. In clinical perspective Immunomodulators can be classified into the following three categories. Immuno-adjuvant, immuno-stimulants and Immuno-suppressants. Immuno-adjuvants are used for enhancing, efficacy of vaccines and, therefore, could be considered as specific immune stimulants. Immuno-stimulants are envisaged to enhance body's resistance against infections, these agents are inherently nonspecific in nature, but they can act through both the innate and adaptive arms of the immune response. Immuno-suppressants could be used for control of pathological immune response in autoimmune diseases, graft rejection, graft versus host disease, hypersensitivity immune reaction and immune pathology associated with infections. (Agarwal and Singh 1999).

Chemotherapeutic agents available today have mainly immunosuppressive activity. Most of them are cytotoxic and exerts a variety of side effects. This has given rise to stimulation in the search for investigating natural resources showing immunomodulatory activity. Many medicinal plants are known to have immunomodulatory properties and maintain organic resistance against infection by re-establishing the body's immune system.

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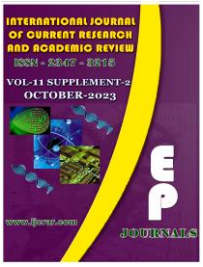

An increasing number of people are adopting alternative systems of medicine owing to the irreversible effects of modern drugs and therapies. Useof medicinal plant products for treatment of various acute and chronic diseasesis gaining increasing importance around the globe. Many plant products have been exploited for modulation of immune system in number of Ayurvedic formulation either alone or in groups (Sudha*et al*., 2009).

Herbal drugs are known to possess immunomodulatory properties and generally act by stimulating both specific and nonspecific immunity. Many plants used in traditional medicine have immunomodulatory activities. Some of these drugs stimulate both humoral and cell mediated immunity. While others activate only the cellular components of the immune system. About 34 plants are identified as rasayanas in the Indian Ayurvedic system of medicine having various pharmacological properties such as immune stimulant, tonic, neurostimulant, antiageing, antibacterial, antirheumatic, anticancer, adaptogenic and antistress.

Terminalia chebula has been reported to exhibit a variety of biological activities including antiviral, antibacterial, antidiabetic, renoprotective, radioprotective, anticancer, antioxidant and adaptogenicactivity.Chemical constituents of Terminalia species have been identified, sterols, aminoacids, fructose, resin and fixed oils. In spite of its many therapeutic effects, to the best of our knowledge, no data are available on the immunomodulatory effect of the nuts of Terminalia chebula at the cellular level. Thus, the objective of the present study was to assess the immunomodulatory potential of the methanol extract of the nut of this plant using murine models.

Materials & Methods

Experimental animals:

Wistar rats weighing between 200-250g were used. Institutional Animal Ethical Committee approved the experimental protocol; animals were maintained under standard conditions in an animal house approved by Committee for the purpose of Control and Supervision on Experiments on Animals (CPCSEA). The animals were given pellet food and water.
Procurement of plant material and extraction:

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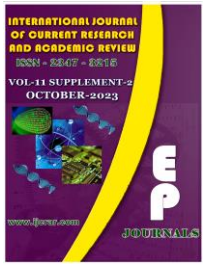

Terminalia chebula nuts were collected from tradition medical shop in Tirunelveli district of Tamil Nadu. The nuts were shade dried powdered and extracted using methanol in a soxhlet. The methanolic extract was used as an immunomodulatory agent.

Experimental protocol–(Sudha *et al*., 2010)

Immunomodulatory activity was evaluated using following models of cellular and humoral immunity. All the experiments had four groups consisting of 3 animals each. The first groups served as control, the second group, the third and fourth group were given 250mg/kg, 500mg/kg and 750mg/kg of the methanolic extract of Terminalia chebula respectively.

Neutrophil adhesion test:

Wistar rats were divided into four groups of three animals each. The control group I received distilled water, while animals of treatment group II, III, and IV were given 250mg/kg, 500mg/kg and 750mg/kg of the methanolic extract of Terminalia chebuladaily. On the 14th day of the treatment, blood samples from all the groups were collected by puncturing retro-orbital plexus under mild etheran aesthesia. Blood was collected in vials pre-treated by disodium EDTA and analyzed for total leukocyte count (TLC) and differential leukocyte count (DLC) by fixing blood smears and staining with Leishman's stain. After the initial counts, blood samples were incubated with nylon fiber (80 mg/ml of blood sample) for 15 min at 37°C. The incubated blood samples were again analyzed for TLC and DLC. The product of TLC and % neutrophilgives neutrophil index (NI) of blood sample. Percent neutrophil adhesion was calculated as follows,

$$\text{Neutrophil adhesion} = \frac{NIU - NIT}{NIU} \times 100$$

Where,

NIU: Neutrophil Index before incubation with nylon fiber.

NIT : Neutrophil Index after incubation with nylon fiber

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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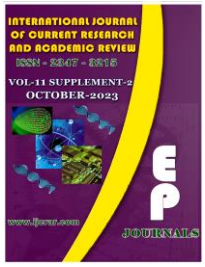

Cyclophosphamide induced neutropenia:

Wistar rats received the drug orally. On 10th day, neutropenic dose of cyclophosphamide (200mg/kg) was injected and this day was labeled as day zero. Blood was collected; the total leukocyte count (TLC) and differential leukocyte count (DLC) was performed prior and on day 3 after injection of cyclophosphamide. The TLC and neutrophil counts (%) in treated groups were compared with the values of the control group.

Indirect Haemagglutination test:

Rats were pretreated with the drugs. On 14th day each rat was immunized with 0.5 x109 sheep red blood cells (SRBCs) intraperitoneally, including control rats. The day of immunization was referred to as day 0. The drug treatment was continued for 14 more days and blood samples were collected from each rat at the end of the drug treatment and the titre value was determined by titrating serum dilutions with SRBC (0.025 x 109 cells) in microtitre plates. The plates were incubated at room temperature for 2h and examined visually for agglutination. The minimum volume of serum showing heamagglutination was expressed as heamagglutination (HA) titre.

Serum immunoglobulin

The drugs were administered to rats. On 21st day after six hours after the last dose blood was collected and the serum was used for estimation of immunoglobulin levels using method devised by (Mullen *et al*., 1975).

Statistical analysis:

The statistical significance was assessed using one-way analysis of variance (ANOVA) followed by T –test. The values are expressed as mean ± SEM and $P< 0.05$ was considered significant.

Result and Discussion:

Immunomodulatory agents of plants and animal origin increase the immune responsiveness of the body against pathogens by activating the non-specific immune system. However, there is a

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

need for systemic studies on medicinal plants to substantiate the therapeutic claims made regarding their clinical utility. In the present study the immunomodulatory activity of methanolic nut extract of Terminaliachebula in experimental models of cellular and humoral immunity in animals.

Incubation of neutrophils with nylon fibres showed a decrease in the neutrophil counts due to adhesion of neutrophil to the fibers. The neutrophil adhesion to nylon fibers describes the margination of polymorphonuclear lymphocytes in the blood vessels and the number of macrophages reaching the site of inflammation (Shinde *et al*., 1999). Varying doses ofTerminaliachebula extract [TCE] showed significant increase in the neutrophil adhesion when compared to the control. (Fig 1) This might be due to the up regulation of the β2 integrins, present on the surface of the neutrophils through which they adhere firmly to the nylon fibres (Srikumar*et al*., 2005). The low dose (250mg/kg) and high dose (750mg/kg) of TCE was found to be more effective than medium dose (500mg/kg) of TCE. There was also rise in neutrophil count in untreated blood of all treatment groups. Hence, it was inferred that TCE causes stimulation of neutrophils towards the site of inflammation.

Administration of cyclophosphamide reduced the TLC in control animals.Pre-treatment of animals with TCE for 10 days before cyclophosphamide administration produced reduction in TLC with low and high doses respectively. The percentage of reduction in neutrophil count was found to be decreased after administration of cyclophosphamide. Both low and high doses of TCE causes decrease in the cyclophosphamide induced neutropenia suggesting that it attenuates the effect of cyclophosphamide on the haemopoetic system.

The high dose of TCE showed a significant increase in the serum immunoglobulins levels when compared to the control (Fig 2). The serum immunoglobulin levels suggest that the amount of antibodies present in the serum. The zinc sulphate turbidity test is used to gain a rough estimation of the amount of immunoglobulin present in the serum. A small amount of serum was added to a zinc sulphate solution and allowed to incubate at room temperature for 1h. Zinc sulphate will cause precipitation of the immunoglobulins, which makes the solution cloudy instead of clear. A lack of cloudiness signifies lack of immunoglobulins(Johnson *et al*., 1995). The turbidity is expressed as ZST units, which in turn indicates the amount of immunoglobulin present in the sample. Terminaliachebula extract at low dose (250mg/kg body weight) showed a

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

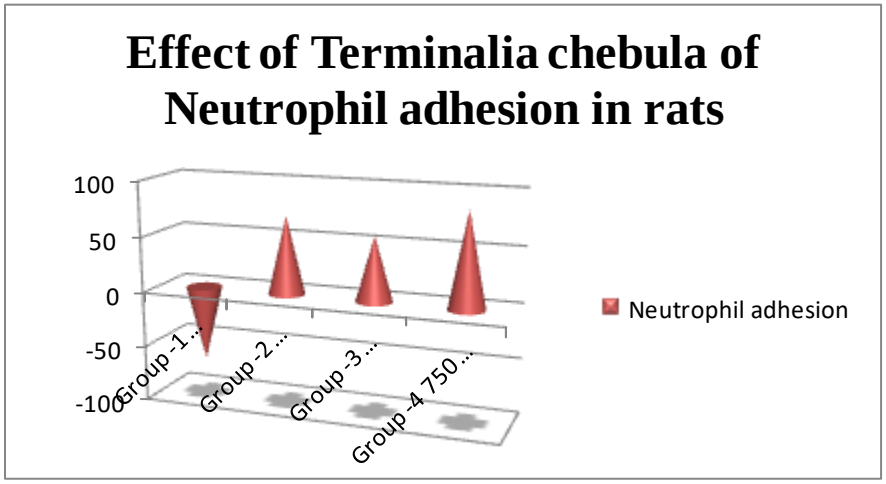
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

significant increase in the serum immunoglobulin (0.115±0.037) when compared to the control (0.023±0.003).

The indirect haemagglutination test was performed to confirm the effect of Terminalia chebula extract on humoral immune system. It was composed of interacting B cell with antigens and subsequently proliferating and differentiating into antibody producing cells. Antibody works by binding with antigens and neutralizing it facilitating its elimination by cross linking to form latex that is more readily ingested by phagocytic cells (Gokhale *et al*., 2003). The results showed that levels of circulating antibodies are increased when the test animals were pretreated with Terminalia chebula extract.

Hence Terminalia chebula extract (TCE) was found to have a significant immuno-stimulatory activity on both the specific and non-specific immune mechanisms. The significant increase in the immuno-stimulatory activity of TCE could be attributed to thepresence of flavonoids, tannins, and phenolic compounds. Therefore, the plant was used as an immunostimulating agent. Thus, the study validated the traditional use of TCE as a 'Rasayana' in Ayurvedic system of medicine.

Figure.1 Effectof the methanol extract of the nuts of Terminalia chebula on neutrophil adhesion in rats



All values are expressed as mean ± SEM of three observations. **P<0.01 when compared to control.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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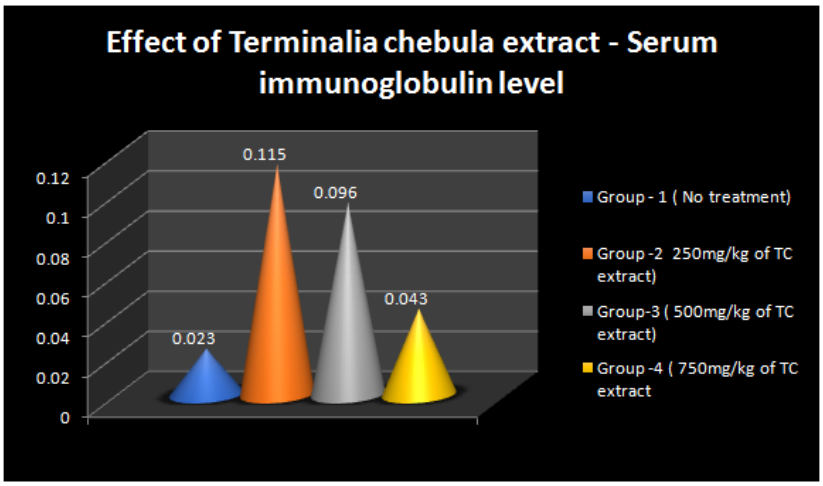
Figure.2 Effect of methanol extract of the nuts of Terminalia chebula on cyclophosphamide induced neutropenia



All values are expressed as Mean ± SEM of three observations. **P<0.01 when compared to control

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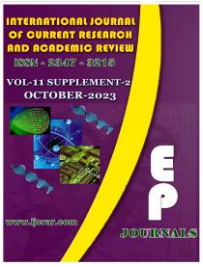

Full Length Article **IJCRAR/FL/68**

Production of Xanthan Gum from Tender Coconut Shell Coirs

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Abstract

Xanthomonas sp was isolated from infected leaf of paddy plant. The isolate was confirmed as *Xanthomonas oryzae* by Egg yolk hydrolysis test which showed opaque halo sheen surrounding the colonies due to the degradation of lecithin present in egg yolk. *Xanthomonas oryzae* produced polymeric compound by fermentation which was later found as Xanthan and was confirmed by FTIR analysis with KBr. The trial for the production of xanthan gum was done from a new substrate source coconut coir extract by liquid fermentation in a closed system. Coconut coirs contains fermentable carbohydrates like cellulose and hemicellulose which was fermented by cellulases of *Xanthomonas oryzae* and the product obtained by batch fermentation after 7 days was recovered by various possible solvent extraction processes using Acetone, Ethanol, Isopropanol, Methanol in the ratio of 1:3. The extracted crude xanthan after confirmation of its functional group by FTIR analysis is tested for its dye holding (restrainer) capacity on a white cloth. The dye restraining property was checked by calorimetric assay in which it was clearly evident that 50% of dye can be restrained on the cloth when it is coated by xanthan gum. This is only an attempt of using xanthan gum as a dye holding agent. This study serves as evidence to suggest the use of xanthan gum in dye formulations for long lasting colours.

Keywords: Xanthan, Polymer, Additives.

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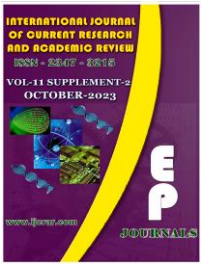

Introduction

Xanthan gum is a natural polysaccharide and an important industrial biopolymer. It was discovered by an American research team headed by Allene Rosalind Jeans in the 1950s at the Northern Regional Research Laboratories (NRRL) of the United States Department of Agriculture. Xanthan gum is a high molecular weight, pseudoplastic, and water-soluble heteropolysaccharide with a 2:2: glucose-mannose ratio. Its main chain is beta-D-glucose, similar to cellulose, and contains acetic and pyruvic acid, resulting in an anionic polysaccharide with a 2×106 Da molecular weight.

Properteis of Xanthan gums

Xanthan gum is a highly effective and stable ingredient in various industries, including food production. Its properties include high viscosity, pseudoplastic behaviour, and stability in various salt concentrations, temperatures, and pH levels. Its interactions with plant galactomannans, such as locust bean gum and guar gum, increase viscosity synergistically. Xanthan solutions are used as thickeners, stabilizing suspensions and emulsions in paper mills and textiles, and enhancing oil recovery. It is also used in the food industry due to its solubility in hot or cold water, high viscosity at low concentrations, and stability in acid systems. High levels of acetylation and pyruvilation degree increase the viscosity of water solutions.

Production of xanthan gums:

Aim and Objective

Production of xanthan gum from Tender coconut shell coir (biowaste).

The study focuses on the isolation of polymer-producing bacteria (*Xanthomonas* sp), the use of coconut shell extract for Xanthan production, the recovery of xanthan from batch fermentation, and its application as dye restraining agent.

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International Journal of Current Research and Academic Review

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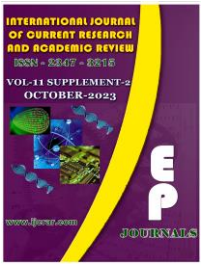

Materials and Methods

Sample collection and isolation

Xanthomonas sp. samples were collected from various samples, including *Xanthomonas* citri collectedfrom infected citrus leaves at Velachery, *Xanthomonas oryzae* collected from paddy grains at Kolappakam, and also from uncooked rice. *Xanthomonas* was isolated from paddy wash water, which was then spread onto Nutrient agar plates.After 48 hours of incubation, the plates were observed for the colony growth. The isolates of *Xanthomonas* sp were identified by Gram Staining and Biochemical tests such as Catalase and Oxidase tests.

Sample identification:

After 48 hours of incubation, the plates were observed for colony growth. The isolates of *Xanthomonas* sp. were identified by Gram staining and biochemical tests such as catalase and oxidase tests. *Xanthomonas oryzae* formed colonies of yellow that appeared as round, convex, mucoid colonies after 48 hours of incubation. These colonies, when gram-stained and observed under oil immersion, clearly showed gram-negative straight rods. Biochemical tests coincided with *Xanthomonas oryzae* sp.; the isolate was catalase-positive and oxidase-negative.

Identification test:

The isolated bacteria are identified and confirmed as *Xanthomonas* by three tests: Starch hydrolysis test, egg yolk hydrolysis test and tween 80 hydrolysis test.

Egg yolk agar is an enriched and differential medium that contains egg yolk for presumptive differentiation of different species based on their lecithinase and lipase activity. Lecithin is a normal component of egg yolk. Lecithinase is an enzyme that splits phospholipid lecithin. Bacterial lecithinase or phospholipases break down this lecithin to an insoluble diglyceride resulting in an opaque halo, surrounding the colony when grown on the medium. The lipase enzyme hydrolyses the fats which results in a sheen on the colony surface.

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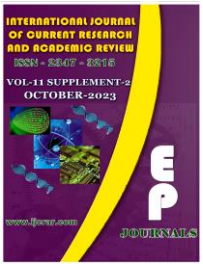

The obtained isolate when tested for egg yolk hydrolysis showed opaque sheen around the colonies. This confirmed the isolate as Lecithinase Positive which is characteristic for *Xanthomonas* sp.

Substrate collection and processing:

The mesocarp layer of used tender coconuts were collected from various market around Velachery. The coirs from the coconut shell were excised at sterile condition and blended with tap water. The liquid was filtered and was transferred to a sterile bottle.

Fermentation process:

100ml of coconut coir extract was taken in sterile conical flask and was steam sterilized for 1 hour. The pH was adjusted to 7 using 0.1N NaOH. 10ml of Nutrient Broth containing the isolated *Xanthomonas*sp was inoculated to the 100ml coconut coir extract.
The extract was kept in the shaker at room temperature for 7 days.

Recovery of xanthan gum:

After seven days of fermentation, the fermented extract was extracted and centrifuged for 25 minutes at 6000 rpm in a sterile centrifuge tube. To precipitate xanthan gum, 40 ml of supernatant was divided into four tubes, each holding 10 ml, and various solvents were applied to each tube. In the tube marked as XGE, 30 ml of ethanol in a 3:1 ratio was added. In the tube marked as XGM, 30 ml of 3:1 methanol was added, and in the tube marked as XGIP, 30 ml of isopropanol was added at a 3:1 ratio. The tube marked "XGA" contained 10 ml of a 1:1 acetone solution. Overnight, the extraction set was allowed to precipitate, after which the gums were recovered by centrifugation. By carefully draining the supernatant liquid, the precipitated gum was separated from the solvents, and the sediments were collected and dried. The obtained gum was dried on a hot plate set to 30oC and formed into pellets. After xanthan gum recovery the dry weight of xanthan gum pellet is calculated and estimated that when using ethanol and isopropanol the recovery is higher.

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Quantitative analysis of substrate and product

Quantitative analysis like total carbohydrates, pyruvic acid analysis was performed for both the substrate coconut coir extract and for the obtained xanthan gum and the values were compared with the standards.

Total carbohydrate concentration was determined by the Phenol Sulphuric Acid method using Glucose as standard for the substrate and also for the obtained product.

Phenol sulphuric acid analysis was performed for coconut coir substrate and the product xanthan gum using glucose as standard and the total carbohydrates was calculated using the formula

Absorbance corresponds to 0.2ml of test = x mg of glucose
100ml of sample contains = x / 0.2 × 100mg of glucose
X / 0.2× 100mg of glucose = % of carbohydrates present.

Coconut coir holds 42% carbohydrates whereas the product xanthan showed 24% of carbohydrates.

Presence of pyruvic acid was determined by the simplified Schwimmer and Weston's pyruvic acid analysis method.

Pyruvic acid analysis was performed for substrate and the product xanthan gum using sodium pyruvate as standard.

Coconut coir extract holds 5.1% of pyruvic acid and with its product xanthan showing 1.9% of pyruvic acid.

Ftiranalysis

Fourier Transform Infrared Spectroscopy (FTIR) analysis was performed for the obtained samples: XGE-xanthan gum Ethanol, XGA – xanthan gum Acetone, XGIP – xanthan gum Isopropanol and XGM – xanthan gum Methanol, and the results were noted.

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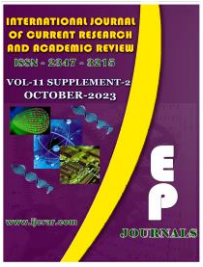

FTIR is an effective analytical instrument for detecting functional groups and characterizing covalent bonding information. FTIR uses interferometry to record information about the sample placed in the IR beam. The spectrum arises from the interferogram being decoded into recognizable spectra. Patterns in spectra help identify the sample, as molecules exhibit specific IR fingerprints. The FTIR spectra are usually presented as plots of intensity versus wavenumber (in cm-1). The intensity can be plotted as the percentage of light transmittance or absorbance at each wavenumber.

FTIR Analysis with KBr was performed to confirm the structural characterisation of obtained xanthan gum and the results were tabulated.

Xanthan gum as dye restrainer:

3×3cm white cloth was taken. The cloth surface was coated with xanthan solution and allowed to dry for overnight. After complete drying, the cloth was d in 1ml of crystal violet dye solution and allowed to dry for 24 hours. Control cloth of 3×3cm size was taken and dipped in 1ml crystal violet dye solution and allowed to dry for 24 hours. Two sterile test tubes were taken a marked as A and B. 5ml of water was taken in both the test tubes. The dried cloths were soaked in the respective test tube and left for 1 hour. After 1 hour, the cloth pieces were removed from the test tube and the quantity of dye penetrated in the water was observed by colorimetry method at 420nm.

The dye holding property of xanthan gum was determined by using calorimetry and the optimal density was noted.

The dye holding capacity in the cloth piece coated with xanthan gum was nearly double as that of uncoated cloth. The optical density value observed for the wash water of cloth was 0.55 in coated extract and 1.01 in the uncoated wash water.

From the values obtained, xanthan gum seems to restrain dye compared to control.

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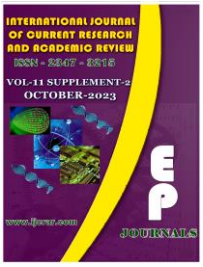

Result and Discussion

This study investigates the potential of tender coconut coirs to produce polysaccharides, such as xanthan gum, a biopolymer used in industrial applications. The study uses *Xanthomonas oryzae* pv oryzae, a Gram-negative bacterium that causes bacterial leaf blight, as a model organism to study plant-pathogen interactions. Coconut coir is composed of cellulose, lignin, pectin, hemicellulose, and ash, with cellulose being processed and converted into energy sources. Lignin, a rigid component, prevents cellulose degradation and is necessary for hydrolysis. The raw coconut coirs typically have 40% cellulose and 30% lignin, which can be processed and converted into energy sources. Grinding the coir for mechanical delignification and cellulose mobilization facilitates easy accessibility of carbon sources in xanthan production. The obtained xanthan gum was similar in structural composition, confirmed by FT-IR analysis when any extraction solvent was used.

The FT-IR spectra of the exopolysaccharide from commercially available xanthan gum have broad absorption peak at 3317.34 cm-1 indicates the hydrogen bonded OH groups. Two peaks, one at 105.39 cm-1 and the other at 458.98 cm-1, are attributed to C-C or C-O and glycoside bending groups. A band of 2894.51cm-1 is due to C–H bending from C-H2 and CH3 vibrations, respectively. The peaks at 1602.74 cm-1 (COO- asymmetric stretching) and 1419.51 cm-1 (COO− symmetric stretching) are due to carboxyl group. As compared with commercially available xanthan gum FT-IR spectra, The FT-IR spectra of the EPS from rice husk have a broad absorption peak at 3311.55 cm-1 indicates the hydrogen bonded OH groups. A band of 2839.02cm-1 is due to C–H bending from C-H2 and C-H3 vibrations, respectively. The peaks at 1622.02 cm-1 (COO- asymmetric stretching) and 1415.65 cm-1 (COO− symmetric stretching) are due to carboxyl groups.

As compared with commercially available xanthan gum FT-IR spectra, The FT-IR spectra of the EPS from sugar molasses have a broad absorption peak at 3326.98 cm-1. A band of 2900.74cm-1 is due to C–H bending from C-H2 and C-H3 vibrations, respectively. The peaks at 1620.09 cm-1 (COO- asymmetric stretching) and 1415.65 cm-1 (COO− symmetric stretching) are due to carboxyl groups. As compared with commercially available xanthan gum FT-IR spectra, The FT-IR spectra of the EPS from whey have broad absorption peak at 3309.62 cm1 indicates the hydrogen bonded

EXCELLENT PUBLISHERS

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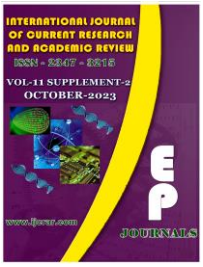

OH groups. A band of 2839.02cm-1 is due to C–H bending from C-H2 and C-H3 vibrations, respectively. The peaks at 1602.74 cm-1 (COO- asymmetric stretching) and 1415.65cm-1 COO− symmetric stretching) are due to carboxyl group As compared with commercially available xanthan gum FT-IR spectra, The FT-IR spectra of the EPS from wheat have broad absorption peak at 3292.26 cm-1 indicates the hydrogen bonded OH groups. A band of 2837.09 cm-1 is due to C–H bending from C-H2 and C-H3 vibrations, respectively. The peaks at 1602.74 cm-1 (COO- asymmetric stretching) and 1409.87 cm-1 (COO− symmetric stretching) are due to carboxyl groups. As per the FT-IR spectra obtained, all shows same pattern of spectra with standard xanthan gum spectra that means recovered crude samples of xanthan were identical to standard xanthan.

Table.1

Sample	Signals	Inference
XGIP	3396 – OH Vibration	Presence of Amines
	2930 – CH bonding 2118	Absence of Ketose sugar Methylated signals
	1641 – Asymmetric stretching 1409 COO^-, H_2 1250 - Symmetric stretching 1068	C-C bonds, Presence of Anionic CHO
	605	Presence of Amines

Table.2

Sample	Signals	Inference
XGE	3438	Presence of Non -OH bond
	2924 – CH bonding	Absence of Ketose sugar
	1645 – Asymmetric stretching	C-C bonds C-O-C bonds, Anionic CHO
	1415 1251 – Symmetric stretching 1073	Common for all polysaccharides
	618	Presence of Amines

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Journal home page: http://www.ijcrar.com

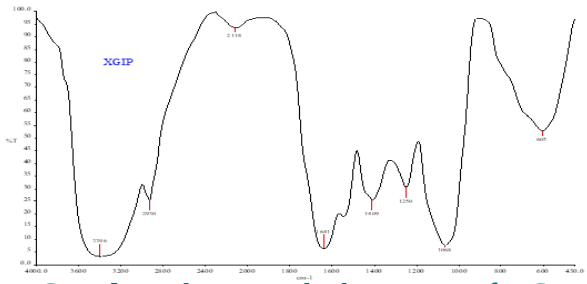
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Table.3

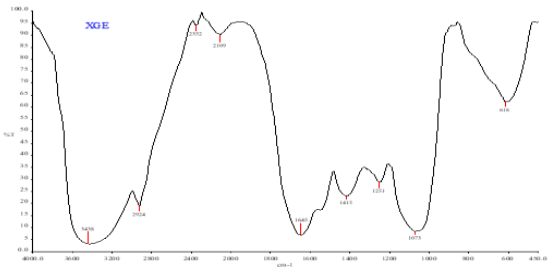
Sample	Signals	Inference
XGA	3391	Non -OH bonds
	2930 – CH bonding 2140	Absence of Ketose sugar
	1641- Symmetric stretching 1408 1251 1073	Presence of Aldehydes, Anionic CHO
	608	Presence of Amines

Table.4

Sample	Signals	Inference
XGM	3420 – OH Vibration	Presence of Amines
	2933 – CH bonding	Absence of Ketose sugar Methylated compounds
	1645 – Asymmetric stretching 1547 COO^-, H_2 1408 – Symmetric stretching 1251 1069	Presence of Anionic CHO
	813,869	Presence of Pyruvic acid
	630	Presence of Amines



Graph: 1 shows peak absorption of XGIP



Graph: 2 shows peak absorption of XGE

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International Journal of Current Research and Academic Review

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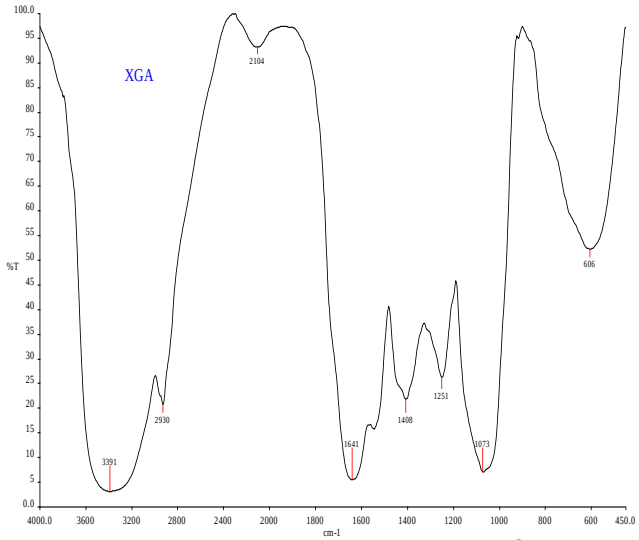
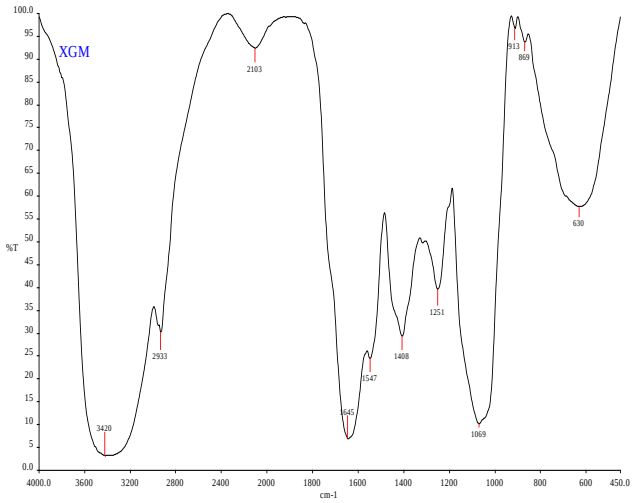


Graph: 3 Shows Peak Absorption of XGA



Graph: 4 Shows Peak Absorption of XGM

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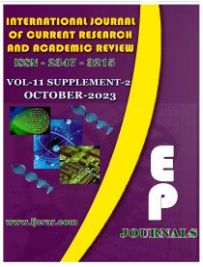

Conclusion

Xanthomonas sp was isolated from infected leaf of paddy plant. The isolate was confirmed as *Xanthomonas oryzae* by Egg yolk hydrolysis test which showed opaque halo sheen surrounding the colonies due to the degradation of lecithin present in egg yolk. *Xanthomonas oryzae* produced polymeric compound by fermentation which was later found as Xanthan and was confirmed by FTIR analysis with KBr. The trial for the production of xanthan gum was done from a new substrate source coconut coir extract by liquid fermentation in a closed system. Coconut coirs contains fermentable carbohydrates like cellulose and hemicellulose which was fermented by cellulases of *Xanthomonas oryzae* and the product obtained by batch fermentation after 7 days was recovered by various possible solvent extraction processes using Acetone, Ethanol, Isopropanol and Methanol in the ratio of 1:3. The extracted crude xanthan after confirmation of its functional group by FTIR analysis is tested for its dye holding (restrainer) capacity on a white cloth. The dye restraining property was checked by calorimetric assay in which it was clearly evident that 50% of dye can be restrained on the cloth when it is coated by xanthan gum. This is only an attempt of using xanthan gum as a dye holding agent. This study serves as evidence to suggest the use of xanthan gum in dye formulations for long lasting colours.

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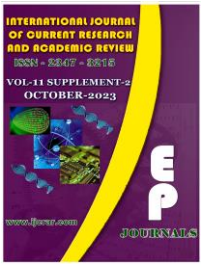

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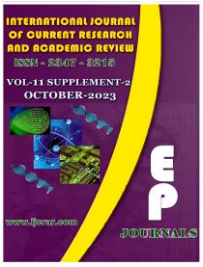

Full Length Article **IJCRAR/FL/69**

A Review on Various Machine Learning Algorithms and its Applications

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Abstract

In the modern world, a substantial volume of data is generated through computer applications, serving as a foundation for prediction and analysis of future trends. Achieving this capability necessitates the training of machines. Through adequate training, machines can process provided data and make predictions, a process known as Machine Learning. Machine Learning, a subset of Artificial Intelligence, holds a pivotal role in intelligent computer programs. It involves instructing machines to respond to diverse input data, allowing accurately tailored outcomes. This paper offers a concise introduction to Machine Learning, explores various Machine Learning algorithms, and discusses associated risks and application domains.

Keywords: Machine Learning, Artificial Intelligence, Algorithms, Applications.

Introduction

Machine learning enables machines to acquire knowledge from their own experiences, akin to human learning. It refers to the development of computer programs that make decisions based on past encounters, effectively allowing computers to learn without explicit programming. When data is provided as input to these applications, they expand and adapt it through experiential learning. This learning process relies on algorithms that recursively learn from data. Machine

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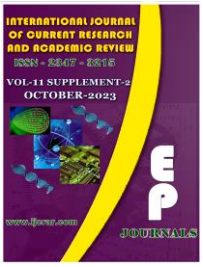

learning empowers applications to respond to new data using iterative processes. Machine learning algorithms ascertain how to predict outputs from given inputs based on prior examples of input-output pairs, known as a training set. To enhance the learning model's accuracy, predictions are tested and adjustments made when discrepancies arise. Machine learning encompasses a range of automated techniques for discerning patterns within complex and feature-rich data, serving as a valuable tool for identifying optimal solutions in intricate datasets.

Types of Machine Learning

There are four basic types of machine learning techniques,

Supervised Learning: In this method of machine learning, machines undergo training using datasets that have been provided with labels. Labelled data refers to data that has been marked with specific labels to indicate particular characteristics, properties, or classification attributes. The entire process operates under supervision, where the labelled data associates input with its corresponding output value. Supervised Learning is employed to address classification and regression challenges.

Unsupervised Learning: The Unsupervised Learning approach does not rely on a pre-trained dataset. Instead, it autonomously identifies patterns or structures within the data. In this method, there is no external guidance or supervision; machines independently discover and analyse information. This approach is valuable for addressing clustering challenges.

Semi-supervised Learning: Semi-supervised Learning is an amalgamation of supervised and unsupervised learning, as it predominantly relies on unlabelled data with a limited portion of labelled input data. The incorporation of this small labelled dataset significantly enhances the efficiency of unsupervised learning.

Reinforcement Learning: Reinforcement learning is an approach centered on feedback. In this machine learning method, an intelligent agent acquires knowledge on how to interact within an environment through input data from that environment. Unlike supervised learning, feedback in this context is not generated through a predefined training process. This mechanism finds practical application in the control of robots.

EXCELLENT PUBLISHERS

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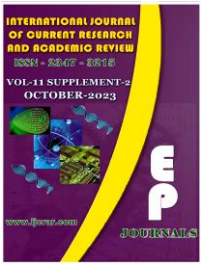

Working Procedure of Machine Learning

The machine learning process commences with the input of data into the algorithm, a phase referred to as training. To assess the algorithm's functionality, data is inputted, and the outcomes are evaluated. If the desired outcome is not achieved, the algorithm undergoes additional rounds of training and testing. This iterative process continues until the desired results are attained. This iterative process enables the machine learning algorithm to learn, enhance its performance, and increase result accuracy.

The effectiveness of the machine learning process is primarily contingent upon the quality of information obtained from external sources, known as outside information. Initially, the learning process involves transforming external information into knowledge, which is subsequently stored in a repository. This repository houses both general information and rules that guide the execution of various tasks. The environment provides a diverse range of information to the learning system, and the quality of this information significantly influences the learning process, whether it is straightforward or intricate.

Additionally, the design of the learning system is influenced by the repository. During the implementation phase, the repository's knowledge is leveraged to carry out specific tasks, and the resulting information is fed back into the repository. This feedback loop guides future learning endeavours.

Machine Learning Algorithms

Machine learning algorithms are categorized based on their operational similarities, specifically how they function. For instance, they are often grouped into network-stimulated methods and tree-based methods, a classification approach we will adopt here due to its practicality. While this method proves valuable for organizing algorithms, it's not without its imperfections. Some algorithms, such as Learning Vector Quantization, seamlessly straddle multiple categories, serving as both a neural network simulated technique and an instance-based technique. Additionally, there are instances where algorithms share the same name, reflecting both the problem they address and the algorithm class they belong to, such as Regression and Clustering.

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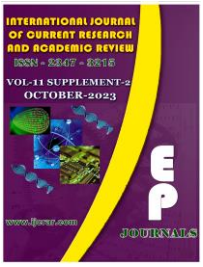

Decision Tree Based Classification

Decision tree algorithm[1] in particular used to create a training/classification/regression model in the form of a tree shape (root, branch and leaf), which is based on (inferred from) preceding facts to classify/expect elegance or target variables of destiny/new information with the assist of decision rules or decision bushes. Decision Trees may be used for numerical as well as specific records. The algorithm works on greedy search generation technique beginning from the top to bottom.

Advantages	Limitations	Applications
➢ It can be implemented easily. ➢ It can classify and predict both categorical and Numeric data. ➢ It needs less pre-processing of data. ➢ Statistical take a look at can be performed to validate the tree model. Resembles human decision-making generation. ➢ Its tree structure is easily understandable through visualization.	➢ It has low Prediction Accuracy. ➢ Calculations are complex if class labels are huge. ➢ It wants of redrawing for every addition of data to the data set. ➢ Chance of over fitting in the decision tree is high.	✓ Agriculture Field ✓ Medicine Field ✓ Financial Analysis

Support Vector Machines

This technique falls under the category of supervised learning algorithms and serves various purposes, including regression, classification, and outlier detection within datasets. Its fundamental goal revolves around identifying a hyperplane that can effectively and precisely separate different classes. The classification of new data is primarily determined based on its alignment with this hyperplane, indicating the class to which it belongs. When constructing a hyperplane, certain rules must be followed. The first rule dictates that the hyperplane must effectively separate the two classes, with a preference for selecting the hyperplane that maximizes

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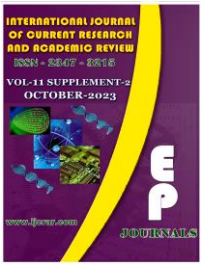

the margin between them. SVM Classifiers come in different forms, including the Linear SVM Classifier and the Non-Linear SVM Classifier.

Advantages	**Limitations**	**Applications**
➢ It is a Robust Classifier for problem prediction. ➢ It is efficient if the number of dimensions is greater than the number of samples. ➢ Suitable for high dimensional data spaces ➢ Memory efficient.	➢ It works slow during test phase. ➢ It is not suitable for noisy and large data sets. ➢ If wrong kernel is selected, then classification error percentage will be increased. ➢ Memory consumption is high.	✓ Image classification ✓ Bioinformatics ✓ Face detection

K-Nearest Neighbours:

K-NN stands as a supervised classifier [2] and serves as an excellent choice for solving classification problems. When it comes to predicting the target label of a new test dataset, K-NN operates by measuring the distances between the class labels of the nearest training data points and the new test data point. This process incorporates the parameter K, representing the number of nearest data points considered. The algorithm calculates the distances from the new data point to its K nearest neighbours, typically using K values ranging from 0 to 10. In this context, Euclidean distance is commonly applied for continuous variables, while Hamming distance is preferred for categorical variables. The outcome of this computation leads to the assignment of the new test data point to a specific class label.

Advantages	**Limitations**
➢ It is flexible with respect to attributes and distance functions ➢ It supports multi class data.	➢ It is difficult to find suitable K value ➢ It needs large samples for high accuracy

EXCELLENT PUBLISHERS

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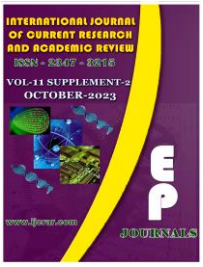

Naïve Bayes Algorithm

The algorithm plays a vital role in the domain of machine learning [4], specializing in comprehensive classification tasks, even when dealing with extensive datasets involving both multi-class and binary class classification challenges. Naïve Bayes finds its primary application in text analysis and natural language processing. A solid grasp of Bayes' theorem is essential for a successful understanding of the Naïve Bayes algorithm. Bayes' theorem serves as the foundational principle that combines multiple classification methods to formulate the Naïve Bayes classifier. This theorem operates on the basis of conditional probability, where the occurrence of an event is influenced by a prior event that has already transpired.

Naïve Bayes types:

a) Gaussian Naïve Bayes
b) Multinomial Naïve Bayes
c) Bernoulli Naïve Bayes

Advantages	**Limitations**	**Applications**
✓ It works fast. ✓ Its performance is scalable. ✓ It is efficient for binary and multinomial distributed attribute values.	✓ It is not suitable for regression problems. ✓ It cannot find relationships among attributes.	✓ Text, e-mail, and symbol analysis. ✓ Recommendation Systems.

Linear Regression

It identifies the association between an impartial variable (predictor, denoted as X) and a structured variable (criterion, referred to as Y) in order to predict future values of the structured variable. Simple regression involves a single independent variable, while multiple regression involves one or more independent variables to make predictions about the future. The structured variable typically exhibits continuous values, while the independent variable may have discrete or continuous values. Regression models come in two main types: linear and non-linear. Linear

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

regression employs a straight line to represent the relationship, while non-linear regression utilizes curved lines to depict the connections between dependent and independent variables.

Advantages	Limitations
✓ It shows relationship between dependent and independent variables ✓ It is simple and easy to understand	✓ It is not applicable for non-linear data. ✓ It predicts numerical output only. ✓ The data must be independent

Comparison of Various Machine Learning Algorithms

Learning Method	Parameter Estimation Algorithm	Model Complexity Reduction
Decision Trees	Many algorithms: ID3, CART, C4.5	Prune tree or limit tree depth
Support Vector Machines (With slack variables, no kernel)	Solve quadratic program to find boundary that maximizes margin	Reduce C value
K-Nearest Neighbours	Must store all training data to classify new points. Choose K using cross validation.	Increase K value
Gaussian Naïve Bayes	Estimate ˆμ, ˆσ2, and P (Y) using maximum likelihood	Place prior on parameters and use MAP estimator
Linear Regression	No closed form estimates. Optimize objective function using gradient descent	L2 regularization

Advantages of Machine Learning

A. Efficiently Discovers Trends and Patterns: Machine Learning excels in uncovering significant trends and patterns within vast datasets, providing insights often beyond human perception. For instance, in e-commerce platforms like Amazon, it employs Machine Learning to understand user browsing and purchase histories, using this information to tailor product recommendations, offers, and reminders, ultimately guiding targeted advertising.

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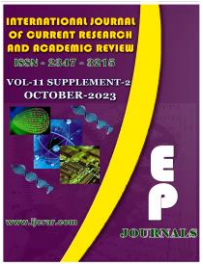

B. Automated, Minimal Human Oversight: Machine Learning operates autonomously, minimizing the need for constant human supervision. It enables machines to learn independently, making predictions and refining algorithms without continuous human involvement. Antivirus software provides a clear example, learning to detect and eliminate emerging threats. Machine Learning also excels in spam detection.

C. Continuous Enhancement: Machine Learning algorithms continuously improve their accuracy and efficiency through accumulated experience. This ongoing refinement enhances decision-making capabilities. Take, for instance, the development of a weather forecasting model. As data volumes grow, Machine Learning algorithms adapt, resulting in more accurate and faster predictions.

D. Broad Applications: Machine Learning's versatility extends across industries like e-commerce and healthcare. In applicable domains, it offers the potential for highly personalized customer experiences and precise audience targeting. Whether in business or healthcare, Machine Learning serves as a flexible tool to enhance services and outcomes.

Flaws in Machine Learning

Despite its numerous advantages, Machine Learning has limitations, including:

A. Data Requirements: Machine Learning necessitates extensive, unbiased, and high-quality datasets for effective training. There may also be instances where it needs to await the generation of new data.

B. Time and Resources: Machine Learning demands significant time for algorithms to learn and achieve a level of accuracy and relevance. It also requires substantial computational resources, potentially necessitating additional computing power.

C. Error Susceptibility: While autonomous, Machine Learning is highly prone to errors. If an algorithm is trained with insufficiently inclusive datasets, it may generate biased predictions

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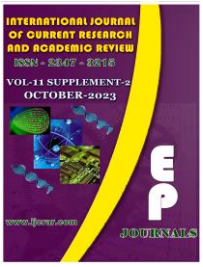

based on its biased training set. This can result in irrelevant advertisements being presented to customers.

Applications of Machine Learning

Few Applications of machine learning are,
A. Medicines and Healthcare Field:
B. E-commerce Product Recommendations
C. Virtual Personal Assistant

Conclusion

This paper gives introduction about the basic concept of machine learning, the basic machine learning model and also its application in various field along with its advantages and disadvantages. It also reviews various machine learning algorithms and techniques such as classification and prediction including the aim, working procedure, advantages, limitations, Real-time Applications, and Implementation tools. The emerging trends in both the Artificial Intelligence and machine learning field needs the strong fundamentals of all the above-mentioned techniques and will be useful in interdisciplinary fields.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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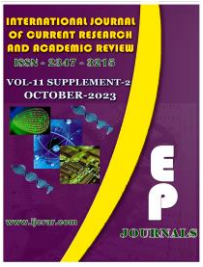

Full Length Article **IJCRAR/FL/70**

A Review on therapeutic Potential of Citrus aurantifolia

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Abstract

Citrus is a commonly consumed fruit because it contains many beneficial nutrients and belongs to Rutaceae family are.The objective of this article is focused on the review on biologically active components of *Citrus aurantifolia*, including the essential oils, flavonoids, terpenoids, phenolic, Limonoids, and alkaloids that originate from various plant parts, as well as their biological activities, including their ability to act as an antibacterial, antioxidant, anticancer, anti-diabetic, anti fungal, anti cholesterol, anti mosquito, insecticide, anthelmintic, astringent, diuretic and anti-inflammatory. Additionally, alternative methods for extracting chemicals from diverse plant matrix regions as well as for microencapsulating bioactive ingredients in food are offered. Hence *C. aurantifolia* canbe utilized for the treatment of diabetes, inflammatory disorder, viral diseases, alzeimers, cancer, obesity and cardiovascular disease.

Keywords: *Citrus aurantifolia*, Bioactive compounds, biological activities, treatment.

Introduction

The edible fruits of the Rutaceae family are called citrus, also known as lime, common lime, and lime. They are raised all over the world in tropical and subtropical regions. They typically have distinctive citrus flavours and fragrances, making them suitable as food and beverage flavouring

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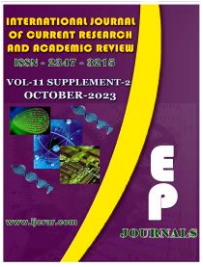

additives. Traditionally, *C. aurantifolia*has been used to lower cholesterol, prevent diabetes, and aid in digestion. Castor oil is used to treat cold, asthma, and arthritis symptoms. Additionally, Crude extracts and essential oils (EOS) from C. Reticulata and *C. aurantifolia*'s leaves, stems, roots, flowers, and peels have demonstrated antibacterial activity against a variety of clinically significant pathogens, particularly gram-positive bacteria. (Sreepian *et al*., 2022).Because of its significant biological properties, such as its ability to fight off pathogens like Staphylococcus aureus, Escherichia coli, Klebsiella pneumonia, Pseudomonas spp., Aspergillus niger, and Candida, the species *C. aurantifolia* has gained recognition. The leaves can be prepared into a poultice or infusion that is used to heal skin ailments, relax a new mother's tummy after childbirth, reduce headaches, rinse the eyes, treat colds, or be gargled for sore throats and other oral conditions (Morton, 1987). The roots' decoction of *C. aurantifolia* is employed as an abortifacient, contraceptive, and vermifuge. It has been employed as an astringent, antibacterial, and tonic. The C.aurantifolia leaves can be prepared into a poultice or infusion that is used to heal skin ailments, relax a new mother's tummy after childbirth, reduce headaches, rinse the eyes, treat colds, or be gargled for sore throats and other oral conditions. The roots' decoction is employed as an abortifacient, contraceptive, and vermifuge. Fever and venereal illness are both treated with it. Lime juice combined with ground seed kernel also reduces fever(Morton, 1987).

Secondary Metabolites

There are vast amount of bioactive active compounds on earth on that only few of the compounds were studies and There are approximately 40000 species of plant are the in the planet,bioactive compounds were studied by using plant sources by using screening methods when it was screened it shows that the plants have more number of components which is used for the therapeutic uses like antifungal, antiviral,antimicrobial,anticancer etc were identifiedfrom research the plant sources of *Citrus aurantifolia*(leaf, fruit,seed,peel) have numerous therapeutic potential like antifungal, antitumor,antioxidant,anticancer etc were going to discuss in this paper.

In citrus, as in many other plant species, sucrose is the primary sugar that moves from the leaves to the fruits. The most translocated sugar in citrus is sucrose, which accumulates at levels twice as high as either glucose or fructose in many types (Goldschmidt and Koch, 1996).Citrus, one in all the world's most significant fruit crops, is sensitive to variety of environmental stresses, including

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International Journal of Current Research and Academic Review

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Journal home page: http://www.ijcrar.com

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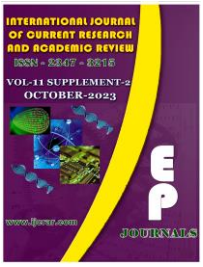

salinity. Citrus phytochemicals such as terpenes, phenolics, limonene, saponins, citrus, quercetin, and scoparone are a few terms to were studied for its activity.

The final byproducts of primary metabolites are thought to be secondary metabolites.A whopping 80% of these bioactive molecules come from plants. They come from organisms other than plants, such as bacteria, fungus, and marine ones. The individual activities of each secondary metabolite are distinct. For instance, terpenoids are utilised as flavouring and aroma ingredients, alkaloids are employed in medicine (vinblastine), and phenolic compounds have antibacterial properties (Durairajthirumurugan *et al*., 2018).

After the growth phase, secondary metabolites are created, and they have the power to improve plant survival. Terpenoids, alkaloids, chemicals with nitrogen and phenols are examples of bioactive substances. (Fongang *et al*. 2020).Flavonoids, carotenoids, phenolic compounds, vitamins, and minerals are examples of secondary metabolites found in *Citrus aurantifolia*. These substances were used by people, and they also helped keep organisms healthy.

Therapeuic potential of *C. aurantifolia* in Anti-diabetic activity

The dosage was made by dissolving 500 mg each of the methanolic extracts of Punica granatum and *Citrus aurantifolia* in distilled water with 1% Tween-80 as a surfactant. To determine the hypoglycemic effects of Punica granatum and *Citrus aurantifolia*, only the methanolic extract from the various solvents was used. (Ramya *et al*., 2020).We noticed the emergence of orange spots that corresponded to various plant phytocompounds (extracted from *Citrus aurantifolia* and Punica granatum fruit skins).

On *Citrus aurantifolia* fruit at different phases of ripening, antioxidant studies were done. According to research on the bioactivity potential of *Citrus aurantifolia*, the plant's flowers, fruits, essential oils, and phytoconstituents have demonstrated a range of biological effects, such as antimicrobial, antioxidant, cytotoxic, anxiolytic, antidiabetic, antiobesity, and anti-inflammatory properties. Although what is the structure(s) of active compounds(s) of plant extract is not defined, reliance on successful treatments to caloric restriction will indicate that such camp-enhancing conditions may be a probable scenario of anti-diabetic effects of the herbal remedies of

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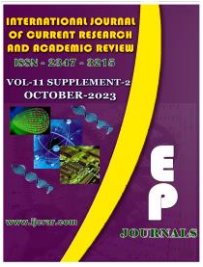

Rauvolfia-Citrus (Suntar *et al* 2018).D-limonene chemotype of *C. aurantifolia* is grown in North-Central Nigeria. In alloxanized rats, the oil significantly reduced blood glucose levels and has the ability to treat issues brought on by dyslipidemia brought on by hyperglycemia. C.aurantifolia leaf essential oil showed significant effects on reducing blood glucose, and the potential for alleviating dyslipidaemic complications caused by hyperglycemia in adolescent rats. Rats in Group IV had diabetes,subjected orally to *Citrus aurantifolia* peel's extract (500 mg/kg body weight) in 1.0 mL of physiological saline (Ibrahim *et al*., 2018).

Anti-microbial activity

Citrus aurantifolia has an antimicrobial effect on TDR Helicobacter pylori strains, indicating that it may have medicinal potential for controlling antibiotic-resistant H. pylori strains that lead to inability of eradication of other antibiotics being used Lee *et al*. (2018). According to Maha S. Al-Aamri *et al*. (2018), tthe oil of *Citrus aurantifolia* demonstrated outstanding bacterial activity against pathogenic Escherichia coli strains.Leaves when tested against Staphylococcus aureus. Plants are utilised to treat infectious ailments like malaria, diarrhoea, burns, gonorrhoea, stomach problems, and others disorders.

The leaves of *C. aurantifolia* show antibacterial efficacy against *Klebsiella pneumonia, Pseudomonas sp., Staphylococcus aureus*, and antifungal activity against *Aspergillus niger, Aspergillus fumigates*, and *Mucor* species. These were acknowledged as providing strong support for the use of this plant in herbal medicine as well as a foundation for the creation of novel medications and phytomedicine (Pathan *et al*., 2012). According to the research by Zage *et al*. (2018), the test isolates' sensitivity to *Citrus aurantifolia* leaf extracts varied according to the organisms' susceptibility hierarchies. The results of this investigation showed that a larger zone of inhibition is visible at higher extract concentrations.

Antibacterial assessment of *Citrus aurantifolia* aqueous ethanol, acetone, chloroform, ethanol and petroleum ether leaves extract conducted by Pathan R, *et al*. (2012) against various pathogen showed significant activity against Staphylococcus aureus, Pseudomonas spp, Klebsiella pneumonia along with antifungal activity against Mucor spp., Aspergillus fumigates and *Aspergillus niger*. This is consistent with the findings of the current investigation. This study's

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International Journal of Current Research and Academic Review

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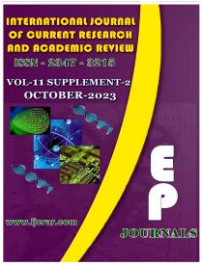

findings agreed with those of Kandpal *et al*. (2012), who isolated actinomycetes from *C. aurantifolia* and evaluated them for antibacterial efficacy against different diseases.

Anti-inflammatory and oxidant activity

By lowering cell migration, cytokine generation, and protein extravasation brought on by carrageenan, *C. aurantifolia* and *C. limonia* demonstrated anti-inflammatory properties (Amorim *et al*., 2018).

In this study, it was shown that the growth and colonisation of Salmonella typhi bacteria in Balb/c mice were affected by lime peel extract (LPE), which was shown to be mediated by IL-6 activity. According to Kasim *et al*. There have been studies done to evaluate the therapeutic properties of lime peel, including its antibacterial, antioxidant, anticancer or antitumor, anticholesterol, antiparasitic, antimosquito, antidiabetic, anti-inflammatory, and anticholinesterase characteristics. Studies on *C. aurantifolia*'s juice, fruit peels, and leaves have shown that the plant has a concentration-dependent impact on the oxidation of low density lipoproteins (LDL). Because of their capacity to donate hydrogen, flavonoids, carotenoids, and vitamin C may be responsible for *C. aurantifolia*'s antioxidant properties (Boshtam *et al*., 2011; Loizzo *et al*., 2012). By blocking the enzymes that produce superoxide anion, such as xanthine oxidase and protein kinase C, flavonoids found in the fruit juice and peel of *C. aurantifolia* indicate their antioxidant activity (Korkina *et al*., 1996).

Anti-viral and Anthelmintic activity

Citrus tristeza virus (CTV) symptoms can be caused by various virus strains, citrus species, or scion-rootstock combinations. By grafting sick plant tissue into a Mexican lime (*Citrus aurantifolia*), CTV is traditionally identified. The Mexican lime will manifest symptoms that are incredibly predictable. The first signs on the leaves are distinct, corky veins, followed by chlorosis and cupping of the leaf. (Peña and Navarro, 1999). Fruit peel extracts from *C. aurantifolia* were found to have ovicidal and larvicidal effects. They were successful in preventing H. bakeri's eggs from hatching and larvae from surviving. To determine and establish the efficacy and

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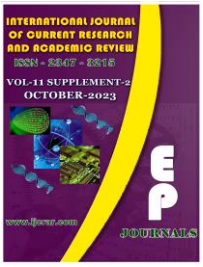

pharmacological basis for the use of *C. aurantifolia* fruit peel extracts as anthelminthic medications (Enejoh *et al*., 2015)

Alzheimer's disease and *Citrus aurantifolia*

Citrus plant waste products, such as seeds, contain anti-Alzheimer's disease doses. The outcome of isolated limonoid and hesperidin from C.aurantifolia both dosages of aurantium seeds compared favourably to the common medication donepezil and demonstrated negligible compared to a normal control, the impacts on AChE and-amyloid levels. Our findings support the usage of C. aurantium for this reason. Seeds of neroli as AD preventative food additives, particularly for those who are at risk, as those who have the age-related neurodegenerative illnesses, prior brain injuries, strokes, or a persistent risk of exposure to heavy metals such as AlCl3, lead, or mercury. (Walczak-Nowicka *et al*., 2021)

Anticancer activity

Citrus aurantifolia extracts against pancreatic cancer andthe bioactive chemicals in C.aurantifolia juice have significant significance in preventing human pancreatic cancer. Calculating the amount of bioactive substances responsible for the proliferation inhibition and radical scavenging activities also helped to clarify the potential mechanism of cytotoxicity induction. According to this study, lime juice's flavonoids and limonoids have an important role in the production of apoptosis-mediated cytotoxicity in human pancreatic cancer cells. (Patil, 2009). According to Patil *et al*. (2009), *C. aurantifolia* juice contains rutin, neohesperidin, hesperidin, and hesperetin as active ingredients. Additionally, they discovered limonoid compounds such limonexic acid, isolimonexic acid, and limonin. Additionally, after 96 hours of exposure, 100 g/ml of *C. aurantifolia* juice extract can inhibit the growth of 73–89% of pancreatic Panc-28 cancer cells. The expression of Bax, Bcl-2, casapase-3, and p53 served as proof that apoptosis had taken place. After 24 hours of exposure, the Iranian fruit juice extract of *C. aurantifolia* suppresses the proliferation of the breast cancer cell MDA-MB-453, according to Gharagozloo *et al*. (2002). Adina *et al*. (2014) observed that after 48 hours of exposure, the 6 and 15 g/ml of Indonesian *C. aurantifolia* peel extract inhibited the proliferation of breast MCF-7 cancer cells at the G1 and G2/M phases, respectively. Additionally seen was the expression of p53 and Bcl-2, which indicated apoptosis.

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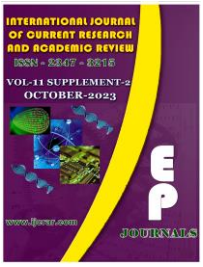

According to Patil *et al*. [2009], *C. aurantifolia* fruit from Texas, USA, contains at least 22 volatile chemicals, with limonene and dihydrocarvone making up the majority of them at 30% and 31%, respectively. After 48 hours of exposure, 100 g/ml of the *C. aurantifolia* extract can prevent the growth of colon SW-480 cancer cells in 78% of cases. It displayed a DNA fragment as well as an elevated level of caspase-3. After a few years, Patil *et al*.(2013) discovered the three novel coumarins, 5-geranyloxy-7-methoxycoumarin, limettin, and isopimpinellin, in the Texas-grown *C. aurantifolia* peel. After being exposed for 72 hours, 25 M of the *C. aurantifolia* extract can suppress the growth of colon SW-480 cancer cells in 67% of cases. The expression of the tumor suppressor genes casapase-8/3, p53, and caspase-3 provided evidence that apoptosis had occurred.

Citrus fruit coumarins have been shown in numerous studies (Miyake *et al*., 1999) to have anti-tumor properties, and citrus fruit seeds and peel extracts have been shown to inhibit Epstein-Barr virus activation. Citrus flavonoids have been shown in studies by So *et al*. (1996) to have inhibitory activity on breast cancer cell lines. There aren't many reports, nevertheless, about the biological properties of citrus macromolecules such as proteins and dietary fibres. Adina *et al*. [66] observed that after 48 hours of exposure, the 6 and 15 g/ml of Indonesian *C. aurantifolia* peel extract inhibited the proliferation of breast MCF-7 cancer cells at the G1 and G2/M phases, respectively. Additionally seen was the expression of p53 and Bcl-2, which indicated apoptosis.

Anti- obesity activity.

Obesity is a serious health condition that can lead to a range of health problems, including heart disease, diabetes, and certain types of cancer. Anti-obesity measures aim to prevent and treat obesity by promoting healthy eating habits, regular physical activity, and other lifestyle. changes.02etotifen with *C. aurantifolia* essential oil combination administration in wistar mice prevented animals from gaining weight. The reduction in body weight was attributed to a possible deportation of anorexia and a decrease in food consumption as in comparison to the control(Asnaashari*et al*,2010)

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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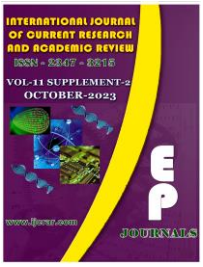

Cardiovascular activity

In other countries traditional medicine, *C. aurantifolia* is used to treat elevated blood pressure. Ex vivo research on isolated rabbit heart corroborated the effect. Aqueous extract of *C. aurantifolia* had adverse chronotropic and inotropic effects on the heart and caused the contractions brought on by adrenalin to relax in a dose-related way. *C. aurantifolia* fruit extract significantly lowered both diastolic and systolic blood pressure in sparguedaweley rats with cadmium-induced hypertension(Sumera 2013)

Conclusion

In this review, *C. aurantifolia* its high nutritional value and several health advantages, *C. aurantifolia* is highly prized. This provides new frontiers for the development of essential oils and extracts into medicinal products. The numerous health advantages of *C. aurantifolia* and its essential extracts are described to a diversity of bioactive compound and its various biological activities

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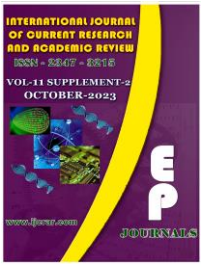

Full Length Article **IJCRAR/FL/71**

A Review on Ferulic Acid and it's Therapeutic Applications

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Abstract

Ferulic Acid is a phenolic compound found in various sources such as seeds, fruits, leaves, peels,beans, seeds of coffee, artichoke, peanut, and nuts. It is a compound which has high anti-oxidant activity, anti-cancer and anti-inflammatory activity. Ferulic acid's complicated antioxidant action mechanism is primarily based on preventing the synthesis of the reactive oxygen species (ROS) or the nitrogen. FA is essential for the synthesis of sinapic acid, curcumin, vanillin, coniferyl alcohol, and other significant chemical compounds as well as the rigidity of the cell wall. The resonance stabilized phenoxy radical formed by the phenolic nucleus and carboxylic side chain in ferulic acid is what has the free radical-scavenging properties. It also shows the anticarcinogenic, antimicrobial, antithrombotic, anti-allergic, anti-diabetic hepatoprotective, increase sperm viability, and anti-viral activity. Ferulic acid is also used as an active ingredients in the production of creams and serums due to it's anti-oxidant property.

Keywords: Ferulic acid, anti-oxidant, anti-inflammatory, anticarcinogenic.

Introduction

Ferulic Acid (FA) is commonly a polyphenolic compound and present in Common sources include grasses, grains, vegetables, flowers, fruits, leaves, beans, seeds of coffee, artichoke,

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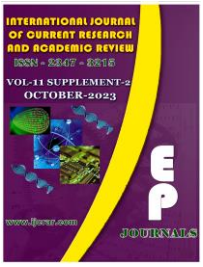

peanut, and nuts, as well as commelinid plants (such as rice, wheat, oats, and pineapple). (Bourne, 1998; Mattila and Hellstrom, 2007; Mattila, 2005, 2006; Srinivasan *et al*. 2007; Wong *et al*., 2007) This compound is majorly present in the plant sources (Hany El-Bassossy et.al.,2016). Some of the plant source like Citrus sinensis (orange; Peleg *et al*., 1991), Punicagranatum (Pomogranate; Cruz-Valenzuela, 2022), Ananas comosus (Pineapple; Tang *et al*., 2020) contains this Ferulic acid compound. Ferulic acid has a wide range of pharmacological activities, including as anti-inflammatory, antioxidant, antibacterial, anticancer, and antidiabetic actions. It has been widely employed in the food, cosmetics, and pharmaceutical industries.

Therapeutic applications:

Anti-oxidant activity:

Although it also involves the neutralization of free radicals, the complex antioxidant action mechanism of ferulic acid is based mostly on the suppression of the formation of reactive oxygen species (ROS) or nitrogen. Additionally, Cu(II) and Fe(II) protonated metal ions are chelated by this acid. Ferulic acid is a free radical scavenger as well as an enzyme inhibitor, increasing the activity of enzymes that scavenge free radicals while decreasing the activity of enzymes that speed up the creation of free radicals. The three main components of its antioxidizing properties are free radical scavenging, binding to transition metals like iron and copper, and inhibiting lipid peroxidation.

High effectiveness in reducing the activity of the enzymes cyclooxygenase and xanthine oxidase in ferulic acid and its derivatives. Ferulic acid is therefore believed to reduce the amount of ROS produced by the enzyme-catalyzed transition. (Zdunska *et al*., 2018).According to reports, FA is a powerful scavenger of ROS and RNS, which lowers the likelihood that free radicals would attack proteins and cause them to undergo oxidative alteration. (Joshi *et al*., 2006)

Ferulic acid is offered as a dietary supplement and in anti-aging serums. Its main function is to combat free radicals, which contribute to age spots, wrinkles, and other skin problems. FA, a phenolic substance, is a potent membrane antioxidant and is well-known to benefit human health. FA is a powerful free radical scavenger and has been allowed as a dietary ingredient in certain

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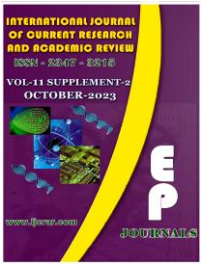

countries to stop lipid peroxidation. It successfully neutralizes the superoxide anion radical and prevents lipid peroxidation. Due to the presence of a phenolic hydroxyl group in its structure, it has antioxidant properties. FA's hydroxyl and phenoxyl groups provide free radicals an electron boost. (Srinivasan *et al*., 2007)

Anti-Viral activity:

Naturally, ferulic acid can be viewed as a model structure for the creation of novel antiviral medications. Some ferulic acid derivatives have been found to have potent antiviral properties against TMV and CMV, including -amino phosphonate, quinazoline, acylhydrazone, sulfonamide units, chalcone, eugenol, and isoeugenol. However, there is little broad-spectrum antiviral action and weak water solubility. Therefore, the amide unit consisting of thiosemicarbazide, thiourea, and amino acid ester moiety were gradually incorporated into ferulic acid backbone to create new ferulic acid derivatives bearing amide moiety in order to develop effective, hydrosoluble, and broad-spectrum antiviral medicines. For the first time, their anti-CMV and anti-TSWV properties were assessed, and compound Y2 had good antiviral efficacy. The target compounds' antiviral mechanisms were also investigated by carefully examining their interactions with the TSWV coat protein (TSWV CP) via molecular docking (Yuanet.al., 2022).Hepatitis B virus (HBV)-specific non-nucleoside acyl oximes of FA were created and synthesized by Liu *et al*. (2015). These compounds had good antiviral activity against HBV and prevented the release of HBsAg and HBeAg into HepG 2.2.15 cells as well as HBV DNA replication. The ferulic acid acylhydrazone derivatives were created by Wang *et al*. (2017) and demonstrated good antiviral activity against the tobacco mosaic virus (TMV) as well as good binding to amino acid residues on the TMV coat protein (TMV-CP).

Anti-inflammatory activity:

In cells activated by the bacterial endotoxin lipopolysaccharide, it has been found that a number of antioxidants, including FA and related ester derivatives, reduce the levels of various inflammatory mediators, such as prostaglandin E2, tumor necrosis factor-alpha, and iNOS production and function. There is evidence that in lipopolysaccharide/interferon- (LPS/IFN) stimulated RAW 264.7 cells, hydrophobic ester derivatives of FA have improved inhibitory action

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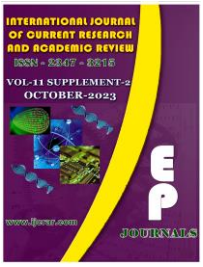

on iNOS protein production. Through the use of the -galactosidase reporter gene assay technique, the feruloyl-myo-inositoid derivatives of FA decreased the activity of the cyclooxygenase-2 promoter in human colon cancer DLD-1 cells. Additionally, it was discovered that FA dose-dependently reduces the synthesis of murine MIP-2, a chemokine superfamily member, in LPS-stimulated RAW 264.7 cells. These results imply that FA may have anti-inflammatory medication potential and show, at least in part, the processes behind its anti-inflammatory action (Srinivasan, et.al., 2007).

Sakai *et al*. (1999) discovered that the RSV-infected macrophage RAW264.7 produced inflammatory protein-2 (MIR-2), and that the presence of FA reduced MIP-2 levels, reducing neutrophil infiltration into the site of inflammation and indicating that FA had a therapeutic effect on inflammation.

Anti-cancer activity:

FA can disrupt the cancer cell cycle, stop the majority of cancer cells in the G0/G1 phase, and have an antitumor effect by inducing autophagy, preventing cell invasion, migration, and angiogenesis, as well as by working in concert with chemotherapy to increase its effectiveness and decrease side effects. Tumor cells are able to develop indefinitely and are resistant to the genes'-caused programmed death. Tumors with this malignant behavior not only make therapy more challenging, but they also contribute significantly to the mortality rate from cancer. The most significant type of planned cell death is apoptosis. FA has a large impact on triggering apoptosis.

MiR-34a expression can be elevated to decrease Bcl-2 and boost apoptosis. It was discovered that FA treatment decreased tumor weight in a dose-dependent manner in a human cervical cancer xenograft model, upregulated caspase-3 protein expression, increased miR-34a expression, downregulated Bcl-2 protein expression, and increased miR-34a expression. As a result, FA's inhibitory effect on transplanted tumors of human cervical cancer in nude mice may be achieved by upregulating miR-34a, which in turn suppresses the expression of its target gene Bcl-2, activates the apoptotic pathway, and encourages cell death. The results of their FA therapy on the gastric cancer MGC-803 cells revealed that FA may both upregulate and down regulate the

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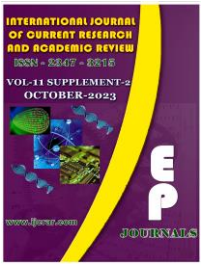

expression of Bcl-2-associated X (Bax) mRNA and protein, effectively triggering apoptosis. These findings imply that the endogenous mitochondrial apoptosis pathway may be involved in the process of FA-induced apoptosis (Bao, et.al., 2023).

Anti-diabetic activity:

The treatment of high-fat and fructose-induced diabetic Wistar rats with intragastrical (i.g.) administration of FA (50 mg/kg) for 30 days consistently restored normal blood glucose, serum insulin, glucose tolerance, and insulin tolerance while also lowering hepatic glucose production in the liver tissue. The ability of the body to use blood glucose for energy production and to promote the storage of glycogen in the liver is improved by maintaining glucose homeostasis, which is made possible by the hepatic glucokinase (GK) enzyme. Additionally, phosphoenolpyruvate carboxykinase (PEPCK) and glucose-6-phosphatase (G6Pase) are the two major enzymes that regulate hepatic gluconeogenesis and glucose production. By raising the hepatic GK enzyme's activity and decreasing the activities of PEPCK and G6Pase, FA effectively increased the rate of glycogenesis. By these they concluded that FA regulates glucose homeostasis via resolving hepatic glucose metabolism disorders (Li, et.al., 2022).

Anti-ageing activity:

Long-term and short-term sun exposure accelerates photocarcinogenesis, erythema, inflammation, and faster skin aging. Oxidative damage is brought on by UV radiation exposure and the resulting production of reactive oxygen/nitrogen species. UV-related disorders such skin cancer, photoaging, immunosuppression, photoallergy, irritation or sunburn, and photoallergy may eventually be the result of these occurrences. The production of stable phenoxyl radicals, which is catalyzed by UV absorption, increases the ability of FA to halt free radical chain processes. FA may also play a crucial role as an antioxidant in protecting the physiological integrity of cells exposed to both air and the incoming UV radiation by efficiently scavenging chain reactions and harmful radicals as well as reducing radiation-induced oxidative processes. (Srinivasan, et.al., 2007).

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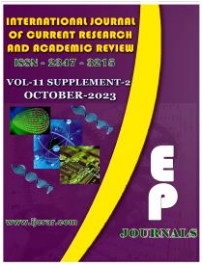

Wound healing and Regeneration:

By affecting the activity of the essential players in the process, such as vascular endothelial growth factor (VEGF), platelet-derived growth factor (PDGF), and hypoxia-inducible factor 1 (HIF-1), ferulic acid is known to have angiogenesis-inducing effects. According to experiments using human umbilical vein endothelial cells, ferulic acid increases the amount of hypoxia-induced HIF-1, which triggers hypoxia-responsive responses, as well as the expression of VEGF and PDGF. Ferulic acid is a helpful molecule for promoting the growth of new capillaries, according to the researchers, who claim that both in vivo and in vitro trials have demonstrated this (Zdunska *et al*., 2018).

Detoxification and hepatoprotective activity:

Since naturally occurring methoxylated phenolic acids, like FA, may be used to reduce drug-induced side effects and avoid toxicity, their detoxifying properties are intensively studied. The progression of liver fibrosis in non-alcoholic steatohepatitis (NASH) is slowed down by ferulic acid. One of the modes of action of FA and its derivatives is also their capacity to reduce the levels of proinflammatory cytokines, demonstrating that FA is beneficial to the immune system.
Ferulic acid displays protective effects against cadmium chloride-mediated reproductive toxicity, ameliorates lead-induced cognitive impairments in vivo, and reduces arsenic-induced developmental cardiotoxicity. Additionally, it guards against damage caused by tetrachloride and arsenic to liver cells and the male reproductive system (Stompor-Goracy and Machaczka, 2021).

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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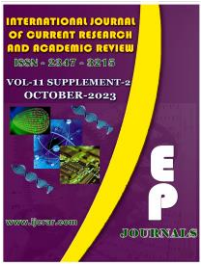

Full Length Article **IJCRAR/FL/72**

A Review on Terminalia chebula – King of Medicine

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Abstract

Natural products are the source of drugs and many therapeutic agents. Discovery of biotic metabolites from natural products has gained momentum and many plants are extensively screened to find out the compound for many pandemic diseases. The nuts of Terminalia chebula have been used in traditional system of medicine and it has become a cynosure of modern medicine. The seeds of this plant contain rich in tannin. As flavonoid, tannin and saponins are a major group of compounds having a rich pharmacological activity, the extracts of the nuts were used for further studies. The traditional healers use the powder of Terminalia chebula nuts to cure wounds. The Tibetan medicine claims that Terminalia chebula is the "King of Medicine". Tannin present in the nuts promoted an efficient wound healing process and this offers an interesting dimension for pharmacologist.

Keywords: *Terminalia chebula*, Tannin, nut, traditional medicine.

Introduction

Terminalia chebula:

Terminalia chebula is a plant species belonging to the genus Terminalia, family Combretaceae. It is a flowering evergreen tree called in English the black myrobalan. It is also known as Haritaki

EXCELLENT PUBLISHERS

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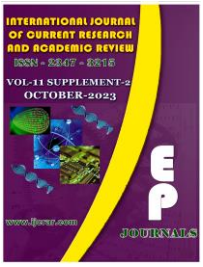

(Sanskrit and Bengali), Harad (Hindi), Karkchettu(Telugu), Kadukkaya (Tamil), Harada(Marathi& Gujarati). It is native to Indian subcontinent and the adjacent areas such as Pakistan, Nepal and the South-West of China stretching as far south as Kerala or even Sri Lanka where it is called Aralu. The fruit of the tree has been used as traditional medicine for household remedy against various human ailments, since antiquity. Terminalia chebula has been extensively used in Ayurveda, Unani and Homoeopathic medicine and has become a cynosure of modern medicine. The Sanskrit name `Haritaki' is rich with meaning, referring to the yellowish dye (harita) that contains, as well as indicating that it grows in the abode of the god Siva (Hari, i.e. the Himalayas), and that it cures (harayet) all diseases. Its other commonly used Sanskrit name, Abhaya, refers to the `fearlessness' it provides in the face of the disease. According to Indian mythology, this plant originated from the drops of ambrosia (Amritha) which fell on the earth when Lord Indra was drinking it.

History of cultivation:

Terminalia chebula has been introduced to Singapore, where it failed, but it was planted successfully in the botanical garden in Bogor, Java. It was also introduced to Penninsular Malaysia. The second largest genus of Combretaceae, Terminalia, consists of 200 species, distributed in the tropics and subtropics (Wickens, 1973). About 30 species of Terminalia are found in Africa (Wickens, 1973). Species of Terminalia vary greatly in morphology, anatomy and karyotype evidence (Excell, 1954; Stace, 1965; Ohri, 1996). The species of Terminalia are small to large trees depending on the growth habitat. In rainforest they can reach heights of up to 50 m, and often grow as emergents, reaching above the upper tree stratum.

Terminalia chebula is a tree whose trunk towers from 40 to 70 feet, its verticillate branches giving the tree a symmetrical head. The leaves are short-petioled, alternate, entire, or slightly denate, arrange on the ends of the branches, coriaceous and spotted. The 10-stamened flowers are white or yellowish, and borne in racemes or spikes. The fruit is a drupe about the size of a large plum.

Natural Habitat

Terminalia chebula occurs scattered in teak forest, mixed deciduous forest, extending into forests of comparatively dry types.

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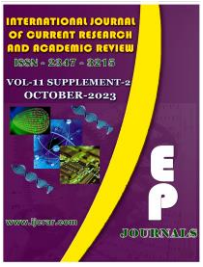

Biophysical limits

Altitude: up to (1500 -2000) m,
Soil type: The species is found on a variety of soils, clayey as well as shady.

Botanic description

Terminalia chebula is a medium to large deciduous tree attaining a height of up to 30 m, with widely spreading branches and a broad roundish crown. The leaves are elliptic oblong, with an acute tip, cordate at the base, margins entire, glabrous above with a yellowish pubescence below. The flowers are monoecious, dull white to yellow, with a strong unpleasant odour, borne in terminal spikes or short panicles. The fruits are glabrous, ellipsoid to ovoid drupes, yellow to orange brown in colour, containing a single angle stone. Terminalia chebula is found throughout deciduous forests of the Indian subcontinent, or dry slopes up to 900 meters in elevation.

Chemical constituents

Terminalia chebula is rich in tannin. The chief constituents of tannin are chebulic acid, chebulagic acid, corilagin and gallic acid. Tannin of Terminalia chebula are of pyrogallol (hydrolysable) type. A group of researchers found 14hydrolyzabletannins (gallic acid, chebulic acid, punicalgin, chebulanin, corilagin, neochebulinic acid, ellagic acid, chebulegic acid, chebulinic acid 1,2,3,4,6-penta –O-galloyl-β-D-glucose, 1,6, di-O-galloyl-D-glucose, casuarinin, 3,4,6-tri-O-galloyl-D-glucose, terchebulin) from Terminalia chebulafruits.

Medicinal and pharmacological activities of Terminalia chebula

Cardiotonic activity:

Extracts prepared from the fruit of Terminalia chebula, when tested on normal as well as hypodynamic isolated frog hearts, increased the force of contraction and cardiac output without changing the heart rate.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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Journal home page: http://www.ijcrar.com

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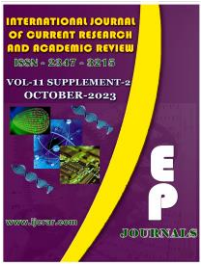

Antianaphylactic activity:

The water-soluble fraction was studied on systemic and local anaphylaxis and found to be effective. Systemic and passive cutaneous anaphylaxis was inhibited and serum histamine levels were reduced in a dose-dependent manner. The fraction also significantly inhibited histamine release from rat peritoneal mast cells, indicating that it may possess antianaphylactic action.

Antimutagenic activity:

The antimutagenicity of an aqueous extract of dry fruits of Terminalia chebula was determined for two direct acting mutagens, sodium azide and 4-nitro-O-phenylenediamine (NPD). A group of researchers have reported the inhibition action on cancer cell growth by the phenolics of Terminalia chebula Retz fruit and found that chebulinic acid, tannic acid and ellagic acid were the most growth inhibitory phenolics of Terminalia chebula (Saleem.*et al*., 2002).

Besides, acetone extract of bark and fruit powder of Terminalia chebula harbors constituents with promising antimutagenic/anticarcinogenic activity (Arora *et al*., 2003).

Chebulinic acid, tannic acid and ellagic acid were the most cancer cell growth inhibitory phenolics isolated from the fruits of T.chebula (Saleem *et al*., 2002). Ellagic acid may arise from the hydrolysis of ellagitannins in the human gut and it has been found to be ten times more antioxidative than tannic acid (Puech *et al*., 1999). Thus, the good invitro anticancer effects. Saleem *et al*., (2002) observed for this compound might be due to its antioxidative properties. Ellagic acid has also been found to induce cell cycle arrest and apoptosis (Narayanan *et al*., 1999), as well as inhibit tumor formation and growth in animals (Stoner & Morse, 1997; Khanduja *et al*., 1999). Triphala has been found to possess antimutagenic properties, and especially extracts made in acetone and chloroform were effective, whereas a water extract gave no activity(Kaur *et al*., 2002b).

Antitumor activity:

Terminalia chebula Retz. (black myrobalan) is an important plant in both Indian as well as Korean and Chinese traditional medicine (Lee *et al*., 1995), where fruits of T. chebula are used for

EXCELLENT PUBLISHERS

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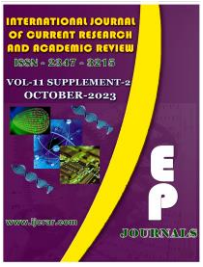


treatment of diarrhea, as an astringent, as an ingredient in Triphala, a mixture containing T.chebula, T.bellerica and Emblica officinalis, (Ram Chandra Reddy *et al*., 1990), as well as for their diuretic and cardiotonic properties (Singh, 1990). Gallic acid, chebulinic acid, chebulagic acid and 1,2,3,4,5,6-penta -O- galloyl-β-D-glucopyranose, isolated from a methanolic fruit extract of T.chebula were found to show moderate cytotoxic effects against melanoma and ovarian cancer cell lines (Lee *et al*., 1995). Saleem *et al*., (2002) found that a 70% methanol extract of the fruits of T.chebula decreased cell viability, inhibited cell proliferation and induced cell death in a dose dependent manner against human brease carcinoma (MCF 7), mouse brease carcinoma (S155), human osteosarcoma (HOS-1) and a prostate cancer cell line (PC-3).Gallic acid, 1, 2, 3, 4, 6, penta –O- galloyl-13-D-glucopyranose, chebulagic acid, isolated from the methanol fraction of Terminalia chebula fruits, exhibited moderate cytotoxicity against cultured human tumour cell lines.

Antibacterial activity:

Gallic acid and its ethyl ester exhibited strong antimicrobial activity against methicillin- resistant strains of Staphylococcus aureus (MSRA). In another study, an extract of T. chebula showed a potent wide-spectrum antibacterial activity against human pathogenic Gram positive and Gram-negative bacteria.

Terminalia chebula exhibited antibacterial activity against a number of bacterial species (Ahmad. Mehmood and Mohammad, 1998). One group of researchers found that it is effective in inhibiting the urease activity of Helicobacter pylori (H.pylori), an ubiquitous bacterium implicated in the development of gastritis, ulcers and stomach cancers (Malczadeh *et al*., 2001). Antibacterial activity of Terminalia chebula against both Gram positive and Gram negative human pathogenic bacteria has also been reported (Sato *et al*., 1997).

Antifungal activity:

An aqueous extract of Terminalia chebula exhibits antifungal activity against a number of dermatophytes and yeasts (Dutta *et al*., 1998; Ray and Majumdar, 1976). It is effective against the

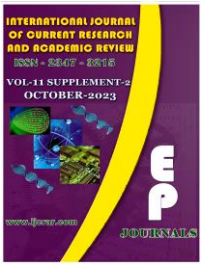
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



pathogenic yeast Candida albicans and dermatophytes Epidermophyton floccosum, Microsporum gypseum and Trichophyton rubrum. (Vonshak *et al*., 2003)

Antiviral activity:

The fruit extract, when orally administered in combination with acyclovir, exhibited a strong anti-HSV-activity by reducing virus in brain and skin more strongly than acyclovir alone. The extract also showed a significant inhibitory activity on HIIV-1 reverse transcriptase.
Terminalia chebula fruits afforded four immunodeficiency virus type 1 (HIV-1) integrase inhibitors, gallic acid (Kirtikar, and Basu 1935) and three galloy glucoses.Terminalia chebula has also retroviral reverse transcriptase activity (Suthienkul *et al*.,1993). It protects epithelial cells against influenza A virus, supporting its traditional use for aiding in recovery from acute respiratory infections. (Badmaev and Nowakowski, 2000).It also showed a significant inhibitory activity on the effects of immunodeficiency virus-1-transcriptase (Mekkawy *et al*., 1995).

Immunomodulatory activity:

The crude extract of a formula containing T.chebula, Tinospora cordifolia, Berberies aristata, Zingibier officinale showed a significant enhancement in humoral immunity measured by haemagglutination titre and cell-mediated immune response, exhibited by inhibition of leukocyte migration.

Antiamoebic activity:

Antiamoebic effects of an ethanolic extract of the formulation above (T. chebula, Tinospora cordifolia, Berberies aristata, Zingibier officinale) against experimental caecal amoebiasis in rats (Entamoeba histolytica) showed an effective cure rate compared with controls.

Antioxidant activity:

An ethanolic extract of the leaves significantly inhibited lipid peroxidation in mouse liver, lung homogenate and mitochondria, by effectively scavenging oxygen free radicals and inhibiting H2O2-induced red cell haemolysis. It also produced a significant inhibition in the

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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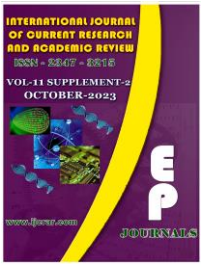

chemiluminescence of human leucocytes induced by tissue plasminogen activator (TPA, 20ng/ml). The extract also prevented DNA breaks in human leucocytes induced by TPA and cigarette smoke condensates.

Six extracts and four compounds of Terminalia chebula fruit exhibited antioxidant activity at different magnitudes of potency (Cheng *et al*., 2003). Its fruit exerts antioxidant and radioprotective activity in rats (Naik *et al*., 2004). It has stronger antioxidant activity than alpha-tocopherol; HPLC analysis with diode array detection indicated the presence of hydroxybenzoic acid derivatives, hydroxycinnamic acid derivatives, flavonol aglycones and their glycosides, as main phenolics compounds (Saleem *et al*., 2001).

Wound Healing Activity:

Topical administration of an alcoholic extract of Terminalia chebula leaves on the healing of rat dermal wounds showed that Terminalia chebula treated wounds healed faster as indicated by improved rates of contraction and decreased period of epithelialization. (Sugana *et al*., 2002). Aqueous extract of Terminalia chebula produced an increase in humoral antibody (HA) titer and delayed type hypersensitivity (DTH) in mice (Shivaprasad *et al*., 2006).

Conclusion

The present review clearly indicates that the extracts of the nuts of Terminalia chebula have valuable bioactive compounds. Further clinical studies and characterization of the particular compound of pharmacological interest in the secondary metabolites will be of great help to develop novel drugs.

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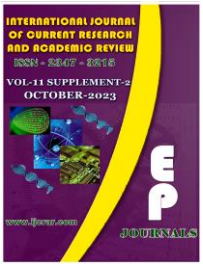

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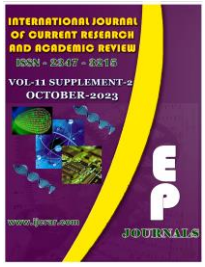

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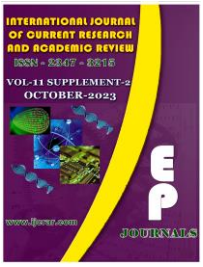

Full Length Article **IJCRAR/FL/73**

A Cross-sectional study to explore the relationship between patient activation, treatment satisfaction and decisional conflict in patient undergoing hemo-dialysis from a tertiary health care centre

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Abstract

Patients approaching end-stage renal disease (ESRD) experience a high level of decisional conflict because they are often Not provided with sufficient support and information regarding Different treatment options prior to renal failure. Decisional Conflict is an important correlate of treatment satisfaction, as it is associated with the disease and the treatment related knowledge that can inform decision-making. Patients activation, the willingness and the ability to independently manage one's own health and health care is an individual difference factors that may have important mitigating effects on Decisional Conflict. To investigate the relationship between patient's activation, treatment satisfaction and decisional conflict in patients undergoing hemodialysis. To identify modifiable factors that may enhance the decision-making in hemodialysis patients. To evaluate patient's activation and treatment satisfaction in Hemodialysis patients. In our study population mean of 72 patients, Mean and Standard deviations of age is (44.32+_ 5.12) 69% were male and 31% were female had 32% of patients with Diabetes Mellitus, 21% of patients with SLE, 10% of patients with heart disease, and 27% of patients with Hypertension is the causes of End-stage renal failure. In 72 participants for the age group of 20-40years

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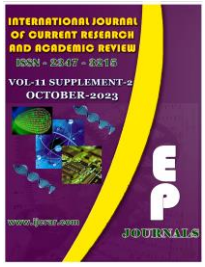

mean and SD of DCS (M= 10.328, SD= 6.54), mean and SD of PAM is (M=38.705, SD=4.6), mean and SD for KDTQ (M=22.667, SD=2.36), mean and SD of depressive symptoms (PHQ) (M= 6.08, SD= 3.8). For the age group of 41-60years Mean and Standard deviations of DCS is (M= 18.14, SD=67.09), mean and SD of PAM (M=34.9, SD=4.2), mean and SD of KDTQ (M=21.7, SD=2.25), and mean and SD of depressive symptoms (PHQ) (M=6.64, SD=2.8). Decision-making and treatment satisfaction is well established, these results suggest this relationship might be partially explained by patient's activation, a potentially modifiable process in patients approaching ESRD. Therefore interventions that encourage patients to become actively involved in their care could also reduce Decisional Conflict among patients approaching.

Keywords: Cross-sectional study, ESRD, hemodialysis.

Introduction

Decisional conflict is the state of uncertainty regarding what course of action to take. (1) It is likely to occur when there are several options available involving many risks and benefits for each. (2) Patients who have high decisional conflict are likely to fluctuate between choices, delay Decision-making, show distress, and question their own values regarding the decision. Unsolved Decisional Conflict can lead to undesirable consequences associated with the decision such as dissatisfaction with the treatment choice and potentially lower adherence to the patients approaching ESRD face a complex medical decision.

Exploring the Relationship Between Patient Activation, Treatment Satisfaction, and Decisional Conflict in Patients Approaching End-Stage Renal Disease 2019 Miriam Vélez-Bermúdez *et al* studied a identify high level of treatment-related decisional conflict among patients approaching ESRD. Moreover, total number of participation in this study 64 patients. activation and CKD-related treatment satisfaction were both identified as significant correlates of decisional conflict, with patient activation acting as a statistical mediator of the association between treatment satisfaction and decisional conflict. Based on our findings, future research should examine ways to improve the decision-making process for advanced CKD patients (2).

The aim of the study was investigating the relationship between patient's activation, treatment satisfaction and decisional conflict in patients undergoing hemodialysis. In this study we are

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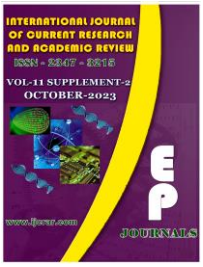

included questionnaires was Decisional conflict scale, Patient's activation measures, Kidney Disease Treatment Questionnaire, Patient's health questionnaire ask to patients and collect all data. Participants were asked to rate their level of decision using the decisional conflict scale (DCS), it includes 16 questions. (2)

Materials and Methods

Study Area

The cross-section study was conducted at hemodialysis unit in department of Nephrology. Sree Balaji Medical College and Hospital, Chromepet, Chennai. We use to calculate decision cofllict scale & patient activation (4).

1. Calculation for Decisional Conflict scale: DCS= (summed/16)X 25
2. Calculation for Patients activation measure:

PAM= (Raw score/Total No. of question answered) X 13

Inclusion Criteria

- End stage renal disease patients maintaining HD.
- Subjects are categorized into 2groups- 20-40years and 41-60years based on the age and decision-making ability.
- Treatment within Hemodialysis center/hospital (2 or 3 times per week).

Exclusion Criteria

- Peritoneal dialysis patients.
- Patients with active infections.
- Patients who are not cooperating.

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Results and Discussion

Gender distribution in the study population

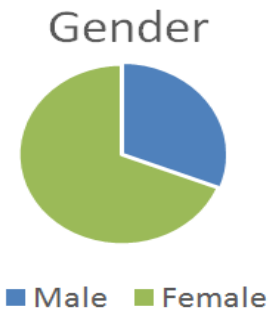

Fig.1 Pie chart showing gender distribution in the study population.

The pie chart is depicting in the study population 50 were male and 22 were female, the frequency of male 69% and female 31%.

Age distribution in the study population.

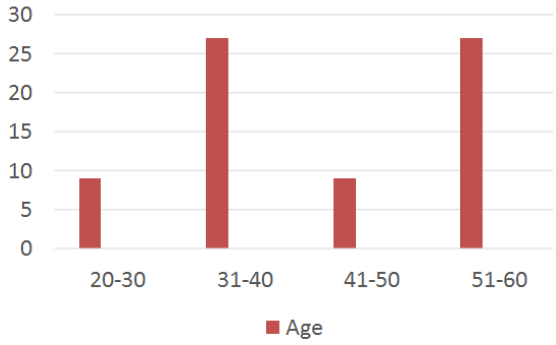

Fig.2 Bar graph showing age distribution in the study population

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The Bar graph is depicting the patients of age 20-40 yrs were 9 patients, age of 31-40yrs were 27 patients, age of 41-50 yrs were 9 patients and age of 51-60 yrs. were 27 patients.

In our study 72 patients undergoing hemodialysis were selected based on inclusion criteria. Age was categorized into two groups 20-40 years and 41-60years, with the mean age of 44.32years. In our study population 69% were male and 31% were female. Out of 72 patients 17% were underweight, 63% were Normal weight, 17% were overweight, and 3 were obese.

BMI distribution in the study population

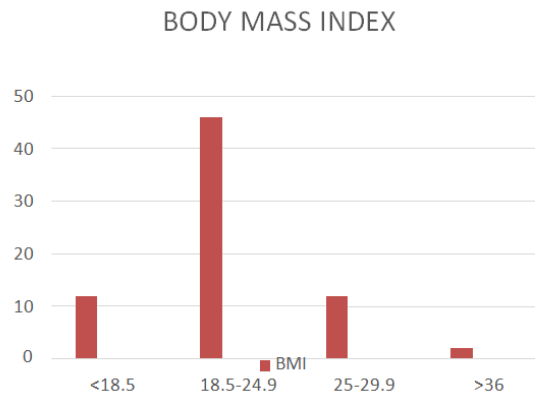

Fig.3 Bar graph showing distribution according to patients BMI.

The bar graph is depicting the patients BMI, patients with underweight were 12 patients, patients with Normal BMI were 46 patients, patients with overweight were 12 patients and 2 patients with obesity.

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Access for hemodialysis distribution in the study population

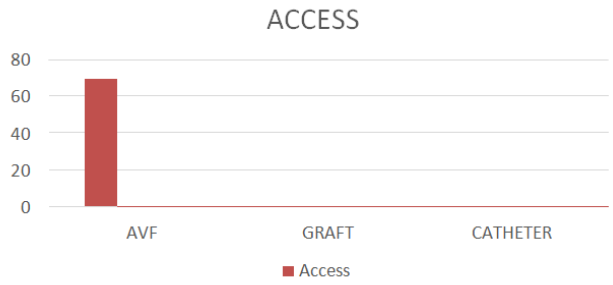

Fig.4 Bar graph showing access for hemodialysis distribution on dialysis.

The bar graph depicting the patients access for HD 69 patients with AVF, 0 patient with Graft, and 3 patients with Catheter.

In our study population 96% of patients had AVF, 0% of graft, 4% were on catheter. Based on our study we observed that the mean and Standard deviations of decision-making ability were 14.23 and 9.2 and the p-value was Non-significant. Mean and SD of patient's activation were 19.84 and 4.4 and the p-value was statistically significant. Mean and SD of treatment satisfaction were 22.17 and 2.305 and the p-value was Non-significant. The majority of the current sample had a high level of decisional conflict. This fits with past observations and reports that patients approaching ESRD typically have trouble deciding which treatment modality to pursue because patients are relatively uninformed about the options and their associated risks and benefits.

Frequency for the hemodialysis distribution in the study population

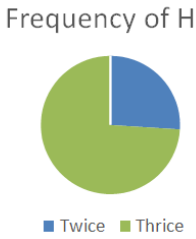

Fig.5 pie chart showing frequency distribution among the HD patients.

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The pie chart depicting the patients frequency of HD 19 patients with 26% were on twice per week of dialysis, and 53 patients with 74% were on thrice per week on dialysis.

Patients should be aware of and informed about what treatment options are available to them. Miriam Vélez-Bermúdez, MS, *et al*. The previous study examined relationships between CKD-related treatment satisfaction, decisional conflict, and patient activation in patients approaching ESRD. Specifically, the study found patient activation statistically mediated the association between CKD-related treatment satisfaction and decisional conflict when controlling for comorbid heart disease. Results showed that higher CKD-related treatment satisfaction predicted lower decisional conflict through higher patient activation.

Causes of CKD distribution in the study population

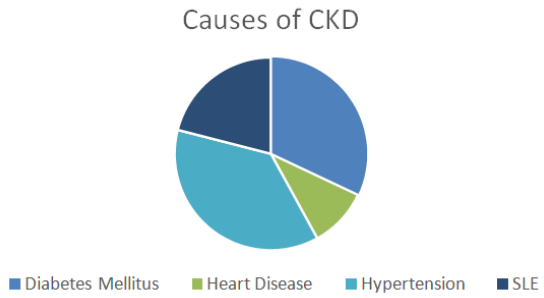

Fig.6 Pie chart showing the distribution of cause of CKD among HD patients.

The pie chart depicting the patients causes of CKD 23 patients with 32% DM, 7 patients with 10% Heart disease, 27 Patients with 37% Hypertension, and 15 patients with 21% SLE.

The causes of CKD in our population were Diabetes Mellitus 32%, Hypertension 37%, 10% Hypertension and Diabetes Mellitus, and SLE 21%. In our study population 26% of patients were on undergoing hemodialysis for twice a week, 74% were on Hemodialysis for thrice a week

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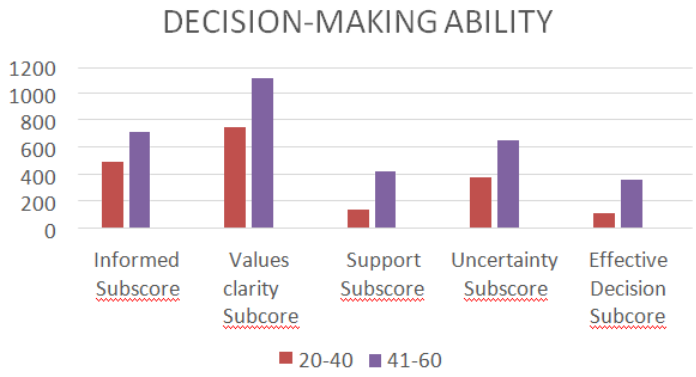
Decision-making ability distribution in the study population



The Bar graph shows that the decision making ability is less in age group of 41-60 yrs compare to 20-40 yrs of patients approaching HD.

Patients activation was evaluated using a short form of the patient's activation measures (PAM-SF-) which is a 13-item assessment intended to measure patients level of skill, knowledge, and confidence regarding how to manage their own health. In this study it has been Noticed that in both the age group 20-40years and 41-60years patients are Not yet believing that their role is important and does Not feel in charge of their own health and care, lacking confidence in their ability to manage their health. (8)

Treatment satisfaction distribution in the study population.

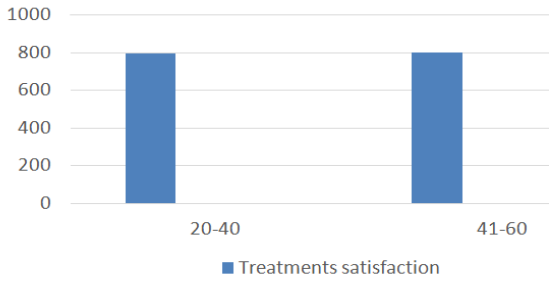


Fig.8. Treatment satisfaction distribution among the age group of the HD patients

The bar graph shows that the treatment satisfaction among the age group 20-40years have less satisfaction compare to the age group of 41-60 years.

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Depressive symptoms distribution in the study population.

The Bar graph shows the depressive symptoms among the age group 20-40years and 41-60 years, patients with No depressive symptoms in 20-40years and 0 patients with No depressive symptoms in 41-60years. 14 patients with minimal depression in 20-40years and 6 patients with minimal depression in 41-60 years. 15 patients with mild depression in 20-40years and 24 patients with mild depression in 41-60years. 5 patients with moderate depression in 20-40years and 6 patients with moderate depression in 41-60years. patients with severe depression in 20- 40years and 0 patients with severe depression in 41-60years. (6,7)

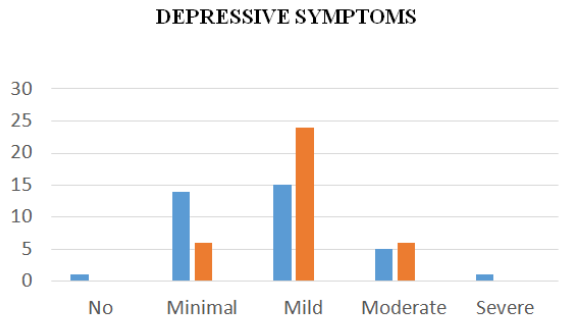

Fig.9. Depressive symptoms distribution among the age groups of HD patients

Conclusion

The present study identified a high level of treatment related Decisional Conflict among patients approaching ESRD. Patients activation was identified as Not believing activation important in both the age groups. Moreover, CKD related treatment satisfaction was good in 41-60yrs age group compare to 20-40yrs age group patients. There is significant relation between age group in patient's activation in the statistics, thus the result shows statistically significant, p-value is <0.0001. But for the decision-making and treatment satisfaction of patients during HD is Not statistically significant. Based on the findings, future researches should examine the ways to improve the decision making process and patient activation for advanced CKD patients. This could be done by using tailored decision aids or other strategies to better engage patients in the

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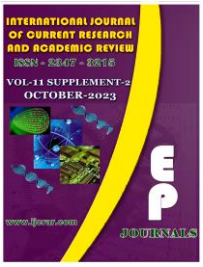

decision making process and feel important in charge of their own health and show confidence in ability to manage their

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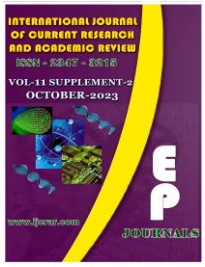

Full Length Article **IJCRAR/FL/74**

Plant Growth analysis using effective Microorganisms (EM) and its effect on the growth of Abelmoschus esculents

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Abstract

Current Research indicates that EM cultures can suppress soil borne pathogens, accelerate the decomposition of organic wastes, increases the availability of mineral nutrients and useful organic compounds to plants, enhance the activities of beneficial microorganisms. EM helps to increase beneficial soil microorganisms and suppression of harmful ones. Effective microorganism comes in a liquid form and consists of naturally occurring beneficial microorganism, the microbes in EM are non- harmful, nonpathogenic, not genetically engineered (or) non modified. The basic groups of microorganisms in EM are Lactic acid bacteria (commonly found in yogurt, cheese), Yeast (bread), Phototrophic bacteria. EM comprise a mixture of live natural culture of microorganisms isolated from fertile soil that are used to improve crop production. Effective Microorganisms is also help to detoxify our landfills, decontaminate our environment, and promote highly sustainable, closed-cycle agricultural and organic waste treatment methods worldwide.

Keywords: Effective microorganism, lactic acid bacteria, yeast, soil.

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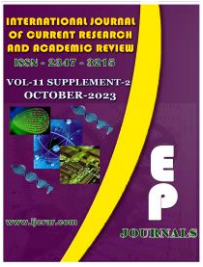

Introduction

Organic food production system is the only alternative for sustainable healthy food production and will provide safe drinking water by regenerating the soil health, environmental health and biodiversity. The key factor in regenerating the soil health is to increase the soil biological properties. Since the principle of organic farming says "feed the soil not to the plant." Now a day's soil become dead due to use of poisonous Agro-chemicals to eradicate the toxic material for soil and the fundamental approach to the transition of conventional to natural farming is that of controlling soil microorganism that directly affect the growth, health and yield of crops. To control soil microorganism ecologically, it is important to know what effect or influence a special organism or mixed culture of microorganism has on the growth and health of a particular crop. Effective microorganisms the first concept of Effective Microorganisms (EM) was developed by Professor TeruoHiga (Higa, 1991; Higa and Wididana, 1991a). EM consists of mixed cultures of beneficial micro-organisms such as photosynthetic bacteria (e.g., Rhodopseudomonaspalustris, Rhodobactersphaeroides), lactobacilli (e.g., Lactobacillus plantarum, L. casei, and Streptococcus lactis), yeasts (e.g., Saccharomyces spp.), and Actinomycetes (Streptomyces spp.; Javid, 2010).

Lactic acid and bacteria produce lactic acid from sugars. Lactobacillus is a beneficial bacterium that allows sterilize soil and take away byproducts which could increase and create a damaging environment. Lactobacillus helps to decomposition and disease suppression. The bacterial cycle is responsible for regulating the balance of composition in soil, to inspire existence by increasing the formation of humus. Lactobacillus also performs as a growth regulator for fungi, yeast and aerobic bacteria (Bonnie Grant, 2017). Lactic acid acts to sterilize soils and suppress harmful microorganisms, as well as growing the decomposition of organic matter (Condor *et al*., 2007) Lactic acid bacteria enhance the breakdown of organic matter inclusive of lignin and cellulose, and ferment these materials greater rapidly. In the present study growth analysis of Abelmoschus esculents was observed using the liquid biofertilizer (EM).

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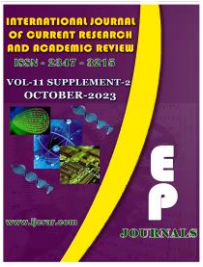

Methodology:

Effective Microorganisms Ingredients:

- Active ingredients: Microorganisms – lactic acid bacteria,yeast, phototrophic bacteria.
- Inactive ingredients: Water and molasses.

Preparation of lactic acid bacteria:

Take 100 ml of washed water (water used for washing the rice) in a 500 ml of beaker. The beaker was covered by a clean cloth and kept aside for aperiod of 7 days. After 7 daysincubation, presence of three layers with a sour smell was observed.

- First layer – Floating compound rice bran
- Middle layer – LAS
- End layer – Starch

Discard the first and third layer, extract the clean middle layer without any disturbance.

Preparation of Secondary culture: To 1 part of clear liquid add 10 parts of Fresh milk. Sprinkle rice bran over the liquid layer to create anaerobic condition. Leave the setup for 5-7 days without agitation. After 7 days incubation, presence of yellow liquid was observed which contains LAB.

Preparation of Effective Microorganism:

Take a clean bottle to that add one liter of coconut water, 4 cups of Lactic acid bacteria, two table spoon of molasses, and four table spoon of fermented rice. Mix all the ingredients and leave it for 10 days. After10 days check the pH (3.7).

Microbial Identification of EM solution:

For the isolation of bacteria, a loopful of EM solution was streaked on sterile Nutrient agar, Mac Conkey agar. After inoculation the plates were incubated at 37^{o}C for 24 hours

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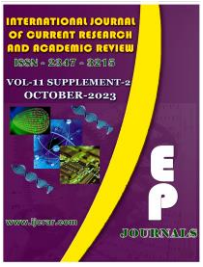

For the isolation of algae, a loopful of EM solution was inoculated into freshly prepared sterile BG11 medium. The tubes were incubated for a period of 15 days. (12 Hrs. Dark / 12 Hrs. Light)

Experimental setup:

Plant selected for the study: Ladies finger / okra

Botanical Name: *Abelmoschus esculentus*

- Group 1 : Lactobacillus + soil
- Group 2 :Yeast + soil
- Group 3 :Algae + soil
- Group 4: Mixed lactobacillus,yeast, algae + soil
- Group 5 : EM + soil
- Group 6 : Soil (control)

Result and Discussion:

Effective microorganism a liquid biofertilizer was prepared. From the EM liquid biofertilizer beneficial microorganisms were isolated and identified. These microorganisms enhance the plant growth activity and it also enhances the uptake of nutrients. There are numerous advantages of using effective microorganisms in agriculture (Urmi and sariah, 2006) Plants might be grow particularly nicely in soils inhabited and dominated via these effective micro-organisms (Sun *et al*., 2014). Crop productivity and quality increased by using Effective microorganisms (Cortez *et al*., 2000) The population of useful micro-organisms in the soil is likewise improved helping to control of soil diseases through competitive exclusion (Postmablaauw *et al*., 2006) This study correlates with our findings that presence of phosphate solubilizing microbes, nitrogen fixing bacteria were isolated from the soil. Addition of EM together with organic manures is thought to be an effective technique for stimulating supply and release of plant nutrients. Studies have shown that inoculating agroecosystems with EM can improve soil and crop quality (Higa and Parr; 1994; Hussain *et al*., 1999).

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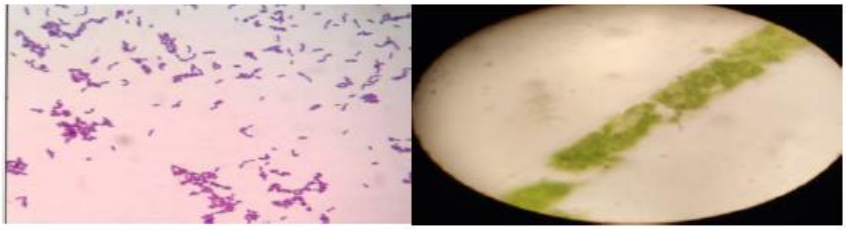

Lactobacillus *Spirogyra*

Lactobacillus + soil Yeast + soil Algae + soil

Mixed lactobacillus, yeast, algae+soil EM + soil Soil (control)

Effective microorganism enhances the activities of beneficial microorganisms, for which fix atmospheric nitrogen and accelerate phosphorus and zinc uptake from soil thereby supplementing the use of chemical fertilizer and pesticides. The accountable use of indigenous microorganisms to get economic, social and environmental benefits is inherently attractive and

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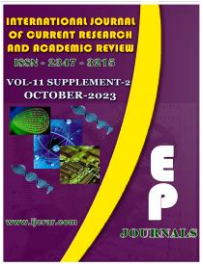

determines a amazing evolution of research from conventional technologies to trendy techniques to offer an efficient way to defend surrounding and new strategies of environmental monitoring (Cai *et al*. 2013)Combined Application of EM associated with organic wastes is reported to enhance soil organic matter content through humification of sparking organic materials; which then leads to advanced soil fitness and enhance microbial activities (Valarini *et al*., 2003)From this study it was concluded that the (EM).Effective microorganisms have the potential to enhance the growth and productivity of crops. These microorganisms can be particularly effective when applied to soils along with organic amendment. It's also helps to improve the soil health and provides multiple ecosystem services

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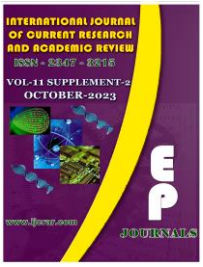

Full Length Article **IJCRAR/FL/75**

Antibacterial Screening by using Plant Extract of Solanum trilobatum and Herbal Candy Formation

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Abstract

Solanum trilobatum (Thooduvali) is one of medicinal plants commonly available in different parts of the world and this plant is used in Indian system of medicine to cure various diseases in human and animals. By using Solanum trilobatum, phytochemical screening, antibacterial screening against *Staphylococcus aureus*, GC-MS study, and herbal candy formulation with the plant extracts were performed.Plant extracts were prepared using Methanol, Chloroform and Aqueous extract. Plant extracts were tested for the presence of Phytochemicals such as Alkaloids, Steriods, Flavanoids, Saponins, Lignans, Tannins, Proteins, Free amino acid, Carbohydrate, and Phenols. MIC and MBC was performed.Chloroform extract of *Solanum trilobatum* (Thuthuvali) showed inhibitory effect against S.aureus at 500µg/ml. HPLC analysis was done to identify the bioactive compounds present in plant extracts. Chloroform extract of Solanum trilobatum, showed the presences of compound such as E-7-Tetradecenol, Ethyltrans-caffeate and phytol. Herbal candy were prepared using *Solanum trilobatum* (Thuthuvali) extract for the consumption of kids and children. In this study, Phytochemical screening of the plant extracts, *Solanum trilobatum* (Thuthuvali) of Chloroform extracts revealed the presence of many "Bioactive components". By using these Phytochemical components new herbal drugs can be formulated to cure many bacterial infections without anyside effects, future studies to be conducted for confirmation.

Keywords: *Solanum trilobatum* (Thuthuvali), Phytochemicals, antibacterial activity, herbal candy..

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Introduction

Solanum trilobatum (Thoothuvalai) is commonly used in Ayurveda and Siddha systems of Medicine.The Indian system of medicine uses this plant to cure various diseases in humans and as well as in animals. It is used to treat diseases like Bronchitis, Asthma, Cancer, and liver infectionsand it is also used to treat several skin diseases.The plant is well known in Ayurveda and Siddha systems. In Sanskrit is known as 'Alarka' in Telugu 'Alarkapatramu' in Tamil 'Tuduvalai and in Malayalam 'Thutuvalam'. The root, berries and flowers are used for cough. Solanum trilobatum. (Solanaceae – herbs) is an important medicinal plant. It is used to cure asthma, arrest blood vomiting, to reduce blood glucose level and bilious matter phlegmatic rheumatism and several kinds of leprosy. In this plant, we can perform various tests by its extract from its parts.

Botanical Name	***Solanum trilobatum***
Genus name	*Solanum*
Species name	*Trilobatum*
Family	Salanaeace
Order	Solanales

Fig 1 *Solanum trilobatum*

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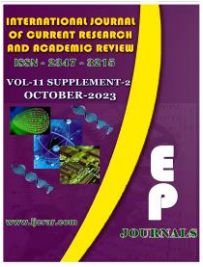

Herbal drugs play a major role in systems of health in Indian, almost 70% of modern medicines in India are derived from natural products. The word 'candy' comes from the Arabic qandi, derived from Persianqand, meaning 'sugan'. There are more than 2,000 kinds of candy are available.

Candies are divided roughly into two main classes:

i) Creamy or Crystalline

There candies contain small crystals in their structure, there are easily chewable and are creamy that melt in the mouth.

ii) Amorphous or Non – Crystalline

There candies include, hard candies, caramels and toffees. These are homogeneous and hard.

Important of Herbal Candy

A herd is a plant or part of a plant valued for its medicinal, aromatic or savourly qualities nature produces several food items for every season. Their use in that particular season proves to be highly beneficial for the mankind which is packed with enormous medicinal advantages. Herbal drugs play a major role in systems of health in Indian, almost 70% of modern medicines in Indian are derived from natural products. In last few years there is an increment occur in the use of herbal medicines.

Materials and Methods

Plant sample (Sanchez *et al*., 2004)

Leaves of Solanum trilobatum were collected from Chennai,Tamilnadu. Healthy and uninfected leaves were identified and selected. The collected leaves were packed instantly in polyethylene bags. The samples were kept frozen at 4◦C until extraction. The samples were washed with water and finally with distilled water to remove the dust and debris. The samples were dried under

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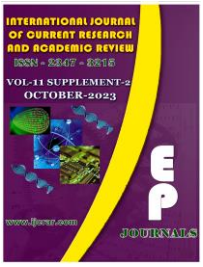

shade at room temperature for 3 days. Finally the dry leaves samples were pulverized into powdered form.

Preparation of plant extracts

Solanum trilobatum (Thoothuvalai)

The leaves of Solanum trilobatumwere dried at room temperature and then crushed into a coarse powder using a blender. Powdered leaves were suspended in petroleum ether and kept in refrigerator overnight to remove fatty substances. After incubation the supernatant was discarded and the residue was dried at room temperature.The residue was further divided into three parts and 25 grams each was suspended in 100 ml of methanol, chloroform and water respectively in a sterile conical flask and kept at 4oC overnight. After incubation the supernatant was filtered through a whatman filter paper no.1 and the filterate was dried to evaporate the organic solvent at room temperature. The sedimented extract was weighed and dissolved in 5% dimethyl sulphoxide.

Extract Preparation In Soxhelet Apparatus

(Akkinibosun and Aboelfetoch mohamed Abdella, 2009)

To identify the compounds present in the sample with the suitable organic solvents system, by using soxhelet extraction method. The Plant extracts was loaded in the soxhelet apparatus, which could dissolve in the particular solvents (methanol, chloroform and water). Then the flask, soxhelet extractor glassware and water cooled condenser were assembled. The solvent was in the bottom flask. The solvent was allowed to boil using electric hot plate. The vapors directed through the extractor to the top mounted condenser. The condensed vapors drip down into the sample filling the extraction cup with solvent. In such a way the clean solvent vapors continuously allowed to condense refilled the soxhlet cup and flushed back into the flask. The cycling action extracted the compound soluble in the solvents, from the sample and collected to the flask. After cooling the flask, the solvent along with extract was condensed by evaporation and then used for further antimicrobial activity studies.

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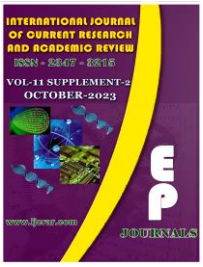

Phytochemical Analysis (Trease and Evans, 1989)

Tannins: (Ferric Chloride Test)

2ml of plant extract was boiled in 10 ml distilled water and few drops of fecl3 were added to the filtrate; a blue- black precipitate indicates the presence of tannins

Alkaloids:(Mayer's Test)

Few drops of Mayers reagent were added to 2ml of plant extract. A yellowish white precipitate was taken as evidence for the presence of alkaloids.

Saponins:(Frothing Test)

5ml distilled water was added to 2ml plant material and the solution was shaken vigorously. Formation of stable foam indicates the presence of saponins.

Steroids:

5 drops of concentrated Sulphuric acid was added to 2ml of plant extract. The formation of reddish brown ring indicates the presence of steroids.

Terpenoids:(Salkowski Test)

2ml of plant extract was treated with 2ml of chloroform [$CHCl_3$] and 3ml of concentrated sulphuric acid [H_2SO_4] was added slowly. A reddish- brown colour indicates the presence of Terpenoids.

Glycoside:

2ml of plant extract react upon boiling with 2ml concentrated Sulphuric acid. The solution is filtered, and equal volumes of chloroform are added and shaken vigorously. Formation of 2 layers indicates the presence of Glycosides.

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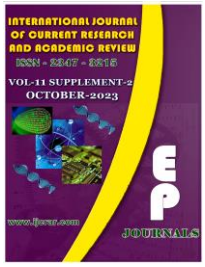

Reducing Sugar:(Fehling's Test)

2ml of plant extracts. 1ml of water and 5 – 8 drops of Fehling solution was added and heated over water bath. Formation of red precipitate indicates the presence of Reducing sugar.

Amino Acids:(Ninhydrin Test)

2ml of plant extract, 2 drops of Ninhydrin were added and boiled for few minutes. Formation of blue colour indicates the presence of Amino acids.

Bacterial Inoculum Preparation (Saudi.,2022)

About 15 samples were collected from the clinical isolates from various hospitals in Chennai.The organism were identified based on the macroscopic and microscopic morphology and special test were done to confirm the particular pathogen. S.aureus is the most commonly found bacteria in patients suffering from URTI. The bacteria is broadly known to be resistant to anti-biotic treatment therefore various plant-based treatment options have been proposed to treat URTI.Test Organism (R Divisha *et al*., 2007) S.aureuswere maintained on nutrient agar slants at 40°C.

Determination of Minimum Inhibitory Concentration (MIC) (Cheesebough, 2002)

MC Farland Standard

0.5 Mc Farland Standards were prepared by adding Barium Chloride and Sulphuric Acid. 0.5ml of 1% Barium Chloride to 99.5ml of Sulphuric Acid and mix well.

Minimum Inhibitory Concentration (MIC)

One ml of the plant extract was incorporated into one ml of Nutrient broth and was serially diluted so as to achieve concentrations ranging from 1000 µg/ml to 31.25 µg/ml respectively. 20 µl of bacterial inoculum was added to each tube and incubated at room temperature for 24 hrs. Suitable controls were included. Nutrient broth with 20 µl of inoculum served as positive control whereas, Nutrient broth alone served as negative control. The whole setup in duplicate was

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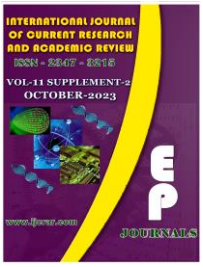

maintained.The MIC was regarded as the lowest concentration of the extract that did not permit any visible growth after incubation when compared with control.

Minimum Bacteriocidal Concentration (MBC)

The dilution in which the extract show no visible growth after incubation was sub cultured on to NA plates with an inoculums size of 1ml. The MBC was regarded as lowest concentration that prevented the growth of any bacterial colony in the solid medium.

HPLC: (Gaurav Mahesh Doshi *et al.*, 2014)

HP-LC analysiswas done to identify the bioactive compounds present in plant extracts. Chloroform extract of Solanum trilobatum

Herbal Candy: (Preeti Shulka *et al.*, 2018)

50ml of water and 250g of sugar was added and mixed and allowed to boil. The powders of Solanum trilobatum is mixed and allowed to boil for 10 mins and observed for the gummy consistency. The mixture was checked for the physical properties and was poured onto the mould and stored.

Results

Totally 15 swabs were collected from different labs in and around Chennai belonging to different age groups. Sample were inoculated on blood agar. The colony morphology of the isolate sample was observed on blood agar. alpha hemolysis or incomplete hemolysis was observed around the colonies. The gram staining of the isolate showed the Gram-positive cocci in clustersSpecial test where done to identify the S.aureus, Of which 7 isolates where isolated. Leaves of Solanum trilobatum were collected from Saidapet, Otteri, Mettukuppam.The herbal plant leaf was washed, dried and grind as powder for the extract.The plant Solanum trilobatum extract was prepared by using solvents methanol, chloroform and aqueous. The sample was screened for the presence of Phytocompounds such as Tannin, Saponin, Steroids, Alkaloids, Glycoside, Treponoids, Reducing

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International Journal of Current Research and Academic Review

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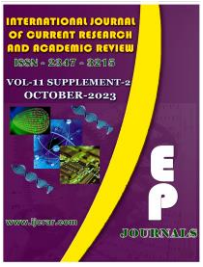

Sugar, Protein. The result of the phytochemical analyze of Solanum trilobatum with methanol, chloroform and aqueous extract were tabulated.The result of the MIC of Solanum trilobatumwith Methanol extract were tabulated. Minimum Inhibitory Concentration was found to be 500(µg/ml)in methanolic extract. Agar well diffusion method is used to determine the antimicrobial activity of plant extract. The results of agar well diffusion for Solanum trilobatum were tabulated. Methanol extract of Solanum trilobatum shows the zone of inhibition of 16mm, 14mm &12mm.

Chromatogram of Methanolic extract of Solanum trilobatum was observed and the compounds present where found to be Solasodine, Solaine, Dehydrotomatine in HPLC. The result were tabulated The Herbal Candy was prepared from the medicinal plants such as Solanum trilobatum The candy was effective against the URTI causing organism called S.aureus. MIC were performed for formulated herbal candy of Solanum trilobatum against S.aureus, the result of MIC showed the concentration of 500µg/ml.

Phytochemical Analyse of Solanum trilobatum

S.No	Test	Result
1	Tannins	+
2	Saponins	+
3	Proteins	+
4	Steroids	+
5	Alkaloids	+

Table.1 represents the phytochemical analyse of Solanum trilobatum with methanol extract as showed positive for Tannins, Reducing Sugar, Saponins, Protein, Steroids, Terpenoids, Alkaloids and Ethyl acetate showed positive for Saponins and aqueous showed positive for Saponins, Reducing sugar, Terpenoids, Glycoside and Alkaloids.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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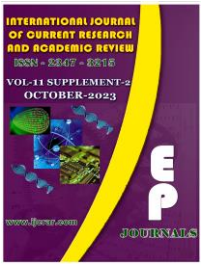

Minimum Inhibitory Concentration of *Solanum trilobatum*

Table.2 represents the MIC of Solanum trilobatum with methanol extract against S.aureus

S.No	Organism	Isolates	Methonolic extract	
			MIC	MBC
1.	*S.aureus*	7	500µg/ml	500µg/ml

Agar Well Diffusion

S.No	Concentration	Zone of Inhibition
1	1000µg/ml	16mm
2	500µg/ml	14mm
3	250µg/ml	12mm
4	Positive control	10mm
5	Negative control	No zone

Table.3 represents zone of inhibition of Methnolic extract of Solanum trilobatum against S.aureus, in agar well diffusion method.

HPLC:

S.No	RT	Compound name	Peak area	%
1	2.883	Solasodine	2165	11.14
2	3.265	Solaine	14755	75.91
3	3.502	Dehydrotomatine	2518	12.95

Table.4 represents the HPLC analysis of Solanum trilobatum. The compounds were identified in HPLC. The highest peak was shown by Dehydrotomatine and other componds are Solasodine and Solaine.

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International Journal of Current Research and Academic Review

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Journal home page: http://www.ijcrar.com

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Fig.1 *Solanum trilobatum*

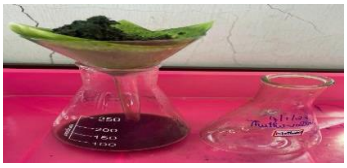

Fig.2 Methanol extract

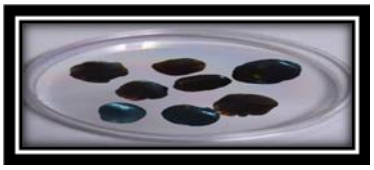

Fig.3 Herbal Candy

Solanum trilobatum was allowed to boil for 10 minutes and observed for the gummy consistency. The mixture was checked for its physical properties and was poured onto the mould and stored. Herbal candy was formulated. MIC was performed for the formulated herbal candy of Solanum trilobatum against S.aureus species. The results were found to be same as that of the MIC results with S.aureus. Fig 2 represents the herbal candy formulation with Solanum trilobatum

Conclusion

In this study phytochemicals screening from the plant extract Solanum trilobatumof methonolic solvent revealed the presence of many bio-active components. These new herbal candies can be used to cure many bacterial infections without any side effects. Plant extracts have been used for various reasons such as their anti-bacterial and anti-fungal properties.

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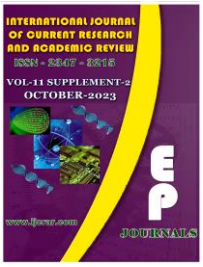

Full Length Article **IJCRAR/FL/76**

A Review on Utilization of Vermicompost as a Soil Amendment in Crop Protection

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Abstract

Composting and vermicomposting are sustainable strategies to transform organic wastes into organic amendments, valuable as potting media or soil conditioner. The use of vermicompost is an effective means of increasing crop yield by increasing the potentials of soil (i.e) to improve the physical, chemical and biological properties of soil.These negative aspects can be limited through the addition of organic, inorganic or biological additives to the composted or vermin composted mixture. The paper provides a brief note on vermicompost processing, technology, amendments, system and its factors

Keywords: Vermicompost, Earthworm, Vermiculture, soil.

Introduction

The food habitats have changed very much for the last five decades. Modern agriculture involves high yielding of crops in a limited span of period with synthetic fertilizers and pesticides,as the population has become doubled during the last half of 20th century. But at the same time this type of modern agriculture leads to environmental problems such as global warming and soil

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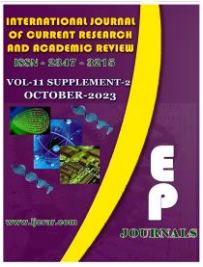

degradation.Overuse of pestisides especially in fruits & vegetables have resulted in residues above the safety level.This paved the way for organic farming.

Vermicompost is an organic Fertilizer.It is done by composting organic waste that's includes decomoposingvegetables, food waste, bedding materials and most importantly worm casting.This is the process of producing vermicompost and is called vermicomposting.This process makes the ordinary soil much more fertile, as it contains five times more nitrogen, seven times more phosphorus, 11 times more potassium and also have a perfect pH Value.This process produces a high fertile inorder to grow the plants healthy.The two earthworm varieties for vermin-composting are Red Wigglerand the red worm.

Earthworm is known as a friend of the farmer. These creatures make the soil absorbent and fertile by their habitat. It is suggested that vermicompostis done naturally in agriculture lands without anypesticides. Thevermicompost is more useful in small scale organic farming, kitchen gardening, container gardening & indoor gardening rather than agriculture.

Overall, the plants need almost 15 nutrients o grow properly. Among this 3 of them are obtained from atmosphere such as Hydrogen, oxygen and carbondioxide. While other 12 nutrients are obtained from the soil namely Nitrogen, Phospherous, Potassium, Sulphur, Calcium, Magnesium, Iron, Zinc, Boron, Manganese, Copper and Molydenum.These 12 nutrients obtained from soil are further grouped into three namely,

- ✓ Primary
- ✓ Intermediate
- ✓ Micronutrients

Nitrogen, Phosphorous and Potassium form the Primary Nutrients to the soil.Nitrogen is responsible for the greenery Leaves of the plants.Phosphorous encourages cell division in plants and Potassium protects the plants from various diseases,encourages root growth.It is the one responsible for making chlorophyll.Sulphur, Magnesium &Clacium form the intermediate Nutrients.The micronutrients are responsible for the healthy growth of the plant.

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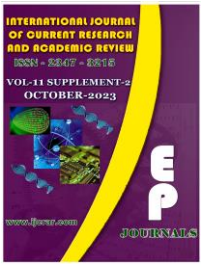

The main advantages of vermicomposting are, it results in nutrients that are immediately beneficial to the plants. When compared to synthetic fertilizers,vermicompost helps in increasing the yield more and also keeps the soil healthy by preventing diseases. A good quality vermicompost is moist, consistent and dark black in color. Vermicompost is more effective than cow-dung.vermicompost is added in soil while potting of a new plant. One part Garden soil, one part coco-peat & one part Vermicompost(i.e) in the ratio 1:1:1 all three are thoroughly mixed and added to the pot. This combination is referred as a universal potting mixture. The technology of using surface and sub- surface varieties of earthworms in composing is called vermitechnology. Vermitechnology consist of three process namely,

- ✓ Vermiculture
- ✓ Vemicomposting
- ✓ Vermiconvertion

Vermiculture means is the cultivation of earthworm to convert organic waste into nutrients.It was first introduced in the year 1970 by a biology teacher, Mary Applehif.A step of vermiculture includes bedding, moisture, and feeding.Vermicompost is an organic Fertilizer.It is done by composting organic waste that's includes decomoposing vegetables, food waste, bedding materials and most importantly worm casting.This is the process of producing vermicompost and is called vermicomposting.

The vermicomposting of organic waste using diverse range of earthworm is shown in the below table 5.Earthworm plays a vital role in organic waste system by colonizing the organic waste along with consumption, digestion and assimilation. In organic waste system, earthworms ingest, grind and digest organic waste with the help of aerobic and anaerobic microflora present in the gut of earthworms. The physical and biochemical actions are performed.The physical action includes substrate aeration, mixing and actual grinding. Biochemical action includes microbial decomposition of substrate in the intestine of earthworm. The resulting worm castings are reported to be rich in microbial activity and well plant growth.

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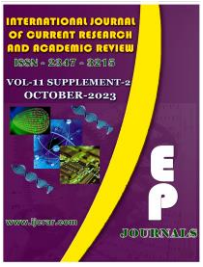

Utilization of Vermicompost increases the Soil Potential

K.A Gopinath *et al*,demonstrated,(2010) the utilization of vermicompost as an organic fertilizer.He gave a detailed study on vermicompost as a soil amendments in the yields of crops particularly cereals, Wheat, legumes, sugarcane, vegetables and fruits.He gave a brief note on soil properties.

Zeynep Demir (2019), focused on the impacts of vermicompost on physiochemical characteristics of sandy-clay-loam soil and lettuce. Experiments were conducted with different VC treatment. The highest lettuce yield was observed in VC Composition. He concludes that the findings that vermicompost treatments under different composition enhance the soil physiochemical properties and lettuce yield.

Gonzalez (2010), presented the effects of amendments was reflected in N and P concentration in beet aerial biogas, through the crop yield was incremented in VC2-BM2.Combaining vermicompost, compost and bone meal was the best option to improve the fertility of the soil and crop cultivation.[4]Mawiyah Mahmud(2018),demonstrated the yield performance of MD2 pineapple growth with vermicompost.In this study, vermicompost was applied to sandy loam soil during transplanting followed with the chemical fertilizers.It was found that there was no significant difference in plants height, leaves, color, height & width of D-leaves, but difference in the yield and the physical characteristics of the resulting fruits.

JustineBarthod *et al* (2018), narrated the main characteristics of composting and vermicomposting mixture, also provides the influence of additives on green gas emission during waste degradation also brief the effects of additives on the soil properties.He analyzed that the additives affect the parameters such as pH,temperature and moisture and also reduces the gas emissions and mobility of minerals.The use of worms increases the fertility of the soil, yielding of crops and decreases N leaching, composting time.

Manuel Blouin *et al*. (2019), narrated the effect of vermicompost on plant growth,he also demonstrated the meta-analysis providing a quantitative summary of vermicompost on plant growth. The vermicompost increases an average yield of about 26% in commercial, 13% in

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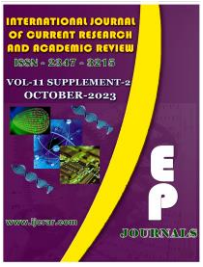

biomass, 78% in shoot biomass and 57% in root biomass. The effect of vermicompost maximizes the potentials of soil about 50%.

Usman Ali *et al* (2015), narrated the review and overview of vermicomposting processes as an eco-friendly approach.Futher the vermin-compost process was optimized to provide better results.Feeding, stocking density, pH, C/N Ratio, temperature and moisture seem to be the critical factors of vermin-composting process.This nutrient richcompost could be used for biogas production.This compost would further used for solid waste generation and energy production.

R.M Atiyeh *et al*, demonstrated the composition of vermicompost contain nutrients that are readily available for plant growth. In greengas production, the growth of marigold and tomato seedlings was enhanced significantly with a substitution of Metro-Mix 360 with 10 % and 20% vermicomposted pig solids or food wastes. Amending the soil with 4% chicken manure compost killed most of the raspberry plants.He also stated that plants grows in soil that contains the mixture of chicken manure compost with 20% vermicomposted pig waste was similar to that of plants grown in unfertilized control.

Gomez Brandon et.al, gives a detailed knowledge of the diverse biological process involved in the recycling and recovery of waste components is of increasing importance for sustainable production and consumption systems.The author provides the recent study that highlights the importance of earthworm and its major microbial communities.Discussed a review of main changes observed in the structure and activity of microbial communities during vermicomposting. He has also narrated that one of the big problem associated with vermicomposting process is the presence of human pathogens

Conclusion

Vermicomposting technology is known throughout the world; although in limited areas.Vemicomposting in several developing countries could prove to be useful in many instances.It also increases the opportunity for employment.Vermicomposthas the potential for improving plant growth when added to soil.The review and the above mentioned tables showed that vermicomposting may be viable and a very low cost option to handle solid waste in an eco-

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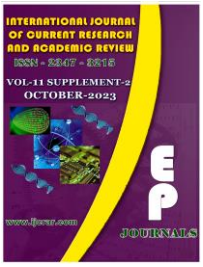

friendly way.It is strongly proved that the vermicomposting technology can be used for economical recycling of solid wastes and also used to manage the waste placed in sewage, open dumps incineration waste in the agricultural fields to reduce groundwater contamination and toxicity of soils.

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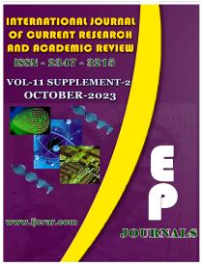

Full Length Article **IJCRAR/FL/77**

Antibacterial Screening by using Plant Extract of Coleus amboinicus and Herbal Candy Formation

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Abstract

Coleus amboinicus (Karupuravali), is a semi Succulent perennial plant in the family Lamiaceae with a pungent Oregano – like flavour and odour. The plant is commonly called as Indian borage or Indian mint. Coleus amboinicusis very popular drug in Indian which is also called as oregano, In some countries, this herb is used in the treatment of ulcers. It is used to treat conditions such as indigestion, diarrhoea, nervous tension, insect bites, tooth ache, ear ache, rheumatism, whooping cough, Skin disease, cough, cold and bronchitis. By using Coleus amboinicus, phytochemical screening, antibacterial screening against Streptococcus pyogenes, HPLC study, and herbal candy formulation with the plant extracts were performed. Plant extracts were prepared using Methanol, Chloroform and Aqueous extract. Plant extracts were tested for the presence of Phytochemicals such as Alkaloids, Steriods, Flavanoids, Saponins, Lignans, Tannins, Proteins, Free amino acid, Carbohydrate, and Phenols. MIC and MBC were performed. Methanolic extract of *Coleus ambinicus* (Karpuravali) showed great inhibitory effect against Streptococcus pyogenes inhibited at 250µg/ml. HPLC analysis was done to identify the bioactive compounds present in plant extracts. Methanolic extract of Coleus ambinicus, showed the presences of Thymoquinone and Thymol. Herbal candy were prepared using Coleus ambinicus(Karpuravali) extract for the consumption of kids and children. In this study, Phytochemical screening of the plant extracts, Coleus ambinicus(karpuravali) of methanolic extracts revealed the presence of many "Bioactive components". By using these phytochemical components new herbal drugs can be formulated to cure many bacterial infections without anyside effects, future studies to be conducted for confirmation.

Keywords: *Coleus ambinicus* (Karpuravali), phytochemicals, antibacterial activity, herbal candy.

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Introduction

Coleus ambinicus(Karpuravali) is a semi-succulent, perennial plant in the family Lamiacaea, this plant is commonly called Indian Borage or Indian Mint. It is used to treat diseases like indigestion, diarrhea, nervous tension, insect bites, toothache, ear ache, and bronchitis. In some countries, this herb (Oregano) is also used to treat ulcers. This plant is distributed throughout India and it is a folkloric medicinal plant used to treat malarial fever, hepatopathy, convulsions and epilepsy. It also has insect repellent properties. The plant is also known to contain the constituents responsible for cytotoxicity and anti-bacterial activity. Herbal drugs play a major role in systems of health in Indian, almost 70% of modern medicines in India are derived from natural products.

Botanical name	***Coleus amboinicus***
Genus name	*Coleus*
Species name	*Amboinicus*
Family	Lamiaceae
Order	Lamiales

Fig.1 *Coleus ambinicus*

EXCELLENT PUBLISHERS

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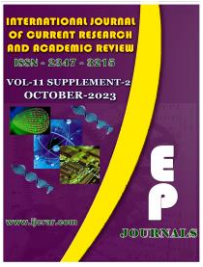

Materials and Methods

Plant Sample (Sanchez *et al.*, 2004)

Leaves of Coleus amboinicuswere collected from Chennai,Tamilnadu. Healthy and uninfected leaves were identified and selected. The collected leaves were packed instantly in polyethylene bags. The samples were kept frozen at 4◦C until extraction. The samples were washed with water and finally with distilled water to remove the dust and debris. The samples were dried under shade at room temperature for 3 days. Finally the dry leaves samples were pulverized into powdered form.

Preparation of plant extracts

Coleus amboinicus (Karupuravali)

The leaves of Coleus amboinicus were dried at room temperature and then crushed into a coarse powder using a blender. Powdered leaves were suspended in petroleum ether and kept in refrigerator overnight to remove fatty substances. After incubation the supernatant was discarded and the residue was dried at room temperature.The residue was further divided into three parts and 25 grams each was suspended in 100 ml of methanol, chloroform and water respectively in a sterile conical flask and kept at 4oC overnight. After incubation the supernatant was filtered through a whatman filter paper no.1 and the filterate was dried to evaporate the organic solvent at room temperature. The sedimented extract was weighed and dissolved in 5% dimethyl sulphoxide.

Extract Preparation In Soxhelet Apparatus (Akkinibosun and AboelfetochmohamedAbdella, 2009)

To identify the compounds present in the sample with the suitable organic solvents system, by using soxhlet extraction method. The Plant extracts was loaded in the soxhlet apparatus, which could dissolve in the particular solvents (methanol, chloroform and water). Then the flask, soxhlet extractor glassware and water cooled condenser were assembled. The solvent was in the bottom flask. The solvent was allowed to boil using electric hot plate. The vapors directed through the

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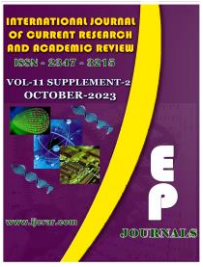

extractor to the top mounted condenser. The condensed vapors drip down into the sample filling the extraction cup with solvent. In such a way the clean solvent vapors continuously allowed to condense refilled the soxhlet cup and flushed back into the flask. The cycling action extracted the compound soluble in the solvents, from the sample and collected to the flask. After cooling the flask, the solvent along with extract was condensed by evaporation and then used for further antimicrobial activity studies.

Phytochemical Analysis (Trease and Evans, 1989)

Tannins: (Ferric Chloride Test)

2ml of plant extract was boiled in 10 ml distilled water and few drops of fecl3 were added to the filtrate; a blue- black precipitate indicates the presence of tannins

Alkaloids:(Mayer's Test)

Few drops of Mayers reagent were added to 2ml of plant extract. A yellowish white precipitate was taken as evidence for the presence of alkaloids.

Saponins:(Frothing Test)

5ml distilled water was added to 2ml plant material and the solution was shaken vigorously. Formation of stable foam indicates the presence of saponins.

Steroids:

5 drops of concentrated Sulphuric acid was added to 2ml of plant extract. The formation of reddish brown ring indicates the presence of steroids.

Terpenoids:(Salkowski Test)

2ml of plant extract was treated with 2ml of chloroform [$CHCl_3$] and 3ml of concentrated sulphuric acid [H_2SO_4] was added slowly. A reddish- brown colour indicates the presence of Terpenoids.

EXCELLENT PUBLISHERS

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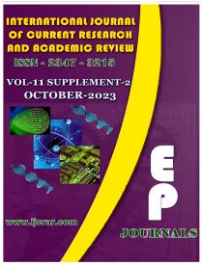

Glycoside:

2ml of plant extract react upon boiling with 2ml concentrated Sulphuric acid. The solution is filtered, and equal volumes of chloroform are added and shaken vigorously. Formation of 2 layers indicates the presence of Glycosides.

Reducing Sugar:(Fehling's Test)

2ml of plant extracts. 1ml of water and 5 – 8 drops of Fehling solution was added and heated over water bath. Formation of red precipitate indicates the presence of Reducing sugar.
Amino Acids:(Ninhydrin Test)
2ml of plant extract, 2 drops of Ninhydrin were added and boiled for few minutes. Formation of blue colour indicates the presence of Amino acids.

Bacterial Inoculum Preparation (Saudi.,2022)

About 15 samples were collected from the clinical isolates from various hospitals in Chennai. The organism were identified based on the macroscopic and microscopic morphology and special test were done to confirm the particular pathogen. Streptococcus pyogenes is the most commonly found bacteria in patients suffering from URTI. The bacteria is broadly known to be resistant to anti-biotic treatment therefore various plant-based treatment options have been proposed to treat URTI. Test Organism (Divisha*et al*., 2007) Streptococcus pyogenes were maintained on nutrient agar slants at 40 C.

Determination of Minimum Inhibitory Concentration (MIC) (Cheesebough, 2002)

MC Farland Standard

0.5 Mc Farland Standards were prepared by adding Barium Chloride and Sulphuric Acid. 0.5ml of 1% Barium Chloride to 99.5ml of Sulphuric Acid and mix well.

EXCELLENT PUBLISHERS

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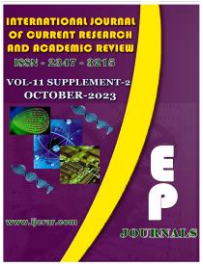

Minimum Inhibitory Concentration (MIC)

One ml of the plant extract was incorporated into one ml of Nutrient broth and was serially diluted so as to achieve concentrations ranging from 1000 µg/ml to 31.25 µg/ml respectively. 20 µl of bacterial inoculum was added to each tube and incubated at room temperature for 24 hrs. Suitable controls were included. Nutrient broth with 20 µl of inoculum served as positive control whereas, Nutrient broth alone served as negative control. The whole setup in duplicate was maintained.The MIC was regarded as the lowest concentration of the extract that did not permit any visible growth after incubation when compared with control.

Minimum Bacteriocidal Concentration (MBC)

The dilution in which the extract show no visible growth after incubation was sub cultured on to NA plates with an inoculums size of 1ml. The MBC was regarded as lowest concentration that prevented the growth of any bacterial colony in the solid medium.

HPLC: (Gaurav Mahesh Doshi*et al.,* 2014)

HP-LC analysis was done to identify the bioactive compounds present in plant extracts. Methanol extract of Coleus amboinicus

Herbal Candy: (PreetiShulka*et al.,* 2018)

50ml of water and 250g of sugar was added and mixed and allowed to boil. The powders of Coleus amboinicusis mixed and allowed to boil for 10 mins and observed for the gummy consistency. The mixture was checked for the physical properties and was poured onto the mould and stored.

Results

Totally 15 swabs were collected from different labs in and around Chennai belonging to different age groups. Sample were inoculated on blood agar. The colony morphology of the isolate sample was observed on blood agar. Beta hemolysis or complete hemolysis was observed around the colonies. The gram staining of the isolate showed the Gram-positive cocci in clusters Special test

EXCELLENT PUBLISHERS

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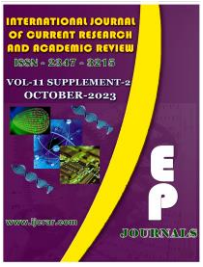

where done to identify the Streptococcus pyogenes, of which 9 isolates where isolated. Leaves of Coleus amboinicuswere collected from Saidapet, Otteri, Mettukuppam.The herbal plant leaf was washed, dried and grind as powder for the extract. The plant Coleus amboinicusextract was prepared by using solvents methanol, chloroform and aqueous. The sample was screened for the presence of Phytocompounds such as Tannin, Saponin, Steroids, Alkaloids, Glycoside, Treponoids, Reducing Sugar, Protein. The result of the phytochemical analysis of Coleus amboinicuswith methanol, chloroform and aqueous extract were tabulated.The result of the MIC of Coleus amboinicuswith Methanol extract were tabulated. Minimum Inhibitory Concentration was found to be 250(µg/ml)in methanolic extract. Agar well diffusion method is used to determine the antimicrobial activity of plant extract. The results of agar well diffusion for Coleus amboinicuswere tabulated. Methanol extract ofColeus amboinicusshows the zone of inhibition of 14mm, 13mm, and 12mm

Chromatogram of Methanolic extract of Coleus amboinicuswas observed and the compounds present where found to be Thymoquinone and Thymolin HPLC. The result were tabulated The Herbal Candy was prepared from the medicinal plants such as Coleus amboinicusThe candy was effective against the URTI causing organism called Streptococcus pyogenes. MIC were performed for formulated herbal candy of Coleus amboinicusagainst Streptococcus pyogenes, the result of MIC showed the concentration of 250µg/ml.

Phytochemical Analyse of Coleus amboinicus

S.No	Test	Result
1	Tannins	+
2	Saponins	+
3	Proteins	+
4	Steroids	+
5	Alkaloids	+

Table 1 represents the phytochemical analyse of Coleus amboinicuswith methanol extract as showed positive for Tannins, Reducing Sugar, Saponins, Protein, Steroids, Terpenoids, Alkaloids and Ethyl acetate showed positive for Saponins and aqueous showed positive for Saponins, Reducing sugar, Terpenoids, Glycoside and Alkaloids.

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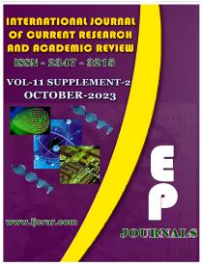

Minimum Inhibitory Concentration of *Coleus amboinicus*

Table.2 represents the MIC of Coleus amboinicus with methanol extract against Streptococcus pyogenes

S.No	Organism	Isolates	Methonolic extract	
			MIC	MBC
1.	*Streptococcus pyogenes*	7	250µg/ml	250µg/ml

Agar Well Diffusion

Table 3 represents zone of inhibition of Methanolic extract of Coleus amboinicus against Streptococcus pyogenes, in agar well diffusion method.

S.No	Concentration	Zone of inhibition
1	1000µg/ml	14mm
2	500µg/ml	13mm
3	250µg/ml	12mm
4	Positive control	10mm
5	Negative control	No zone

HPLC:

Table 4 represents the HPLC analysis of Coleus amboinicus. The compounds were identified in HPLC. The highest peak was shown by Thymol and other compound is Thymoquinone.

S.No	RT	Compound Name	Peak area	%
1	2.760	Thymoquinone	218919	35.31
2	3.821	Thymol	400989	64.69

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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Journal home page: http://www.ijcrar.com

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Fig.1 Coleus amboinicus

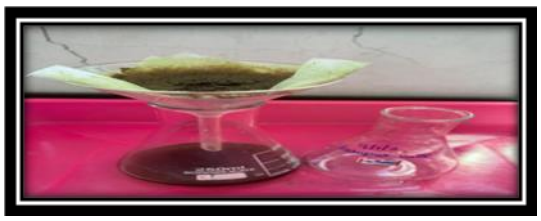

Fig.3 Methanol extract

Fig :2 Herbal candy

Herbal Candy

50ml of water and 250g of sugar were added and mixed and allowed to boil. The powder of *Coleus amboinicus* was allowed to boil for 10 minutes and observed for the gummy consistency. The mixture was checked for its physical properties and was poured onto the mould and stored. Herbal candy was formulated. MIC was performed for the formulated herbal candy of Coleus amboinicus against *Streptococcus pyogenes* species. The results were found to be same as that of the MIC results with *Streptococcus pyogenes*. Fig 2 represents the herbal candy formulation withColeus amboinicus

Conclusion

In this study phytochemicals screening from the plant extract Coleus amboinicus of methonolic solvent revealed the presence of many bio-active components. These new herbal candies can be used to cure many bacterial infections without any side effects. Plant extracts have been used for various reasons such as their anti-bacterial and anti-fungal properties.

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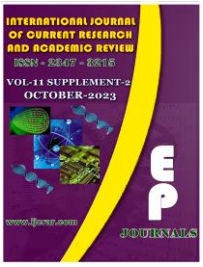

Full Length Article **IJCRAR/FL/78**

Microencapsulation of Probiotic Bacteria Using Almond Gum as a Natural Polymer and Evaluating its Properties

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Abstract

The study investigated the encapsulation ability of almond gum from P. dulcis. The probiotic B. mesentricus was successfully microencapsulated using almond gum. The physical and functional properties of almond gum showed greater potential as an encapsulation agent. It has good swelling index (17.01±0.45%) in a neutral condition. There was a better survival of probiotic bacteria than free cells when exposed to alkaline condition (at pH9) concentration. The temperature stability of microencapsulated probiotic bacteria was found to be viable and too numerous to count at 100o C. The result revealed that extracted almond gum exhibited excellent properties and could be used as a potential encapsulating agent. Microencapsulation may prove to be an important method of improving the viability of probiotic bacteria over the course of the gastrointestinal tract, whether in polysaccharide or protein-based systems.

Keywords: Probiotic, Prebiotic, B. mesentricus, Microencapsulation, almond gum.

Introduction

Probiotics have been extensively studied for their claimed health benefits. Probiotics are defined us "Live microorganisms which when administered in adequate amounts confer a health benefit

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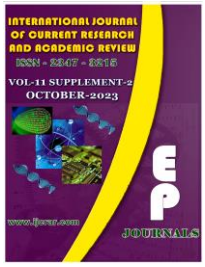

on the host" (FAO/WHO, 2001). In order to have beneficial health effects, the food products enriched with probiotics should contain the required minimum viable microorganisms when consumed. The most commonly used probiotic bacteria belong to the *Bifidobacterium* and *Lactobacilli, Bacillus mesentricus* species, which are also dominant in the human intestine (*Lactobacilli* in the small intestine and *Bifidobacterium* in the large one).

Prebiotic was described as "a non-digestible food ingredient that beneficially affectsthe host by selectively stimulating the growth and/or activity of one or a limited number of bacteriain the colon, and thus improves host health". The International Scientific Association of Probiotics and Prebiotics (ISAPP) defined "dietary prebiotics" as "a selectively fermented ingredient that results in specific changes in the composition and/or activity of the gastrointestinal microbiota, thus conferring benefits upon host health". Microencapsulation is a technique that has been widely used in the food and pharmaceutical industries.

This technique can be used to reduce the cost of production, to increase the stability of compounds, to mask undesirable tastes, and to improve the release properties of compounds in food industries (Arup nag *et al.,* 2010). Almond gum *(Prunus dulcis*) is basically a natural gum obtained from the swe*et al*mond gum tree. Almond gum is composed of almost 92.3% carbohydrates 0.8% of fasts and 24% of proteins.

Almond gum is used as a carrier material to encapsulate probiotic (Uzmafarooq *et al.,* 2014). Almond gum can act as potential wall material for encapsulation. It is rich in minerals, vitamins, antioxidants and also contains traces of sugar (Anitha *et al.,* 2021). This study aimed to assess the effectiveness of almond gum to encapsulate the isolated *Bacillus mesentericus* strains and evaluate its prebiotic activity.

Methodology

Isolation of probiotic organisms from BIFILAC®sachet

The lyophilized probiotic BIFILAC sample in the sachet was added to MRS broth incubated at 37^0C for 24 hours. After 24 hours, the incubated broth was observed for turbidity and serially

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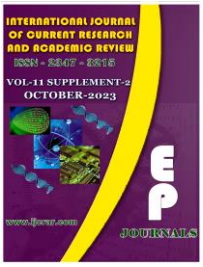

diluted. The sample from 10^{-5} dilution was uniformly spread on MRS medium. The plate was incubated at 37^0C for 24 hrs. Colonies on MRS agar medium after 24 hours of incubation were subjected to biochemical characterization as per the Bergey's Manual of Systematic Bacteriology for confirmation (Kavyasudha *et al.,* 2017). The Biochemical test included Gram strain, endospore forming test, catalase test, oxidase test, Voges-Proskauer test (VP), Methyl red test (MR), utilization of glucose, mannose, mannitol, sucrose, glycogen, citrate utilization test.

Collection of almond gum and estimation of its swelling index

0.1g of almond gum was added to 20ml of distilled water in different pH concentrations- Acidic, Neutral and Alkaline in 3 separate beakers. The initial volume of swelling of almond gum at different pH were noted. The beakers were then left in room temperature overnight. The beakers were checked for the water absorbing capacity of almond gum the next day (Chavali Kavyasudha *et al.,* 2017).

Microencapsulation of probiotic bacteria in almond gum

100ml MRS Broth was prepared and a loop full of organism was inoculated and incubated at 37^0C for 24 hours. After incubation the MRS broth was centrifuged and the supernatant was discarded and pellet was collected.

Next, to 50ml of distilled water 3g of almond gum powder was added to form a jelly like structure. The obtained pellet after centrifugation was added into jelly like almond gum. It was allowed to dry and allowed for the encapsulation of the organism inside the almond gum at 40^0C for 72 hrs (Simas-Tosin *et al.,* 2008).

Checking the water pH stability of microencapsulated probiotic bacteria

0.1g of microencapsulated powder was added to 5ml of sterile distilled water at different pH ranges - 3,5,7,9,11. It was kept for 5days at room temperature. Each of the samples was serially diluted and 10^{-1} dilution was taken and uniformly spread on nutrient agar plates. It was incubated at 37^0C for 24 hrs and its viability was checked (CFU/ml).

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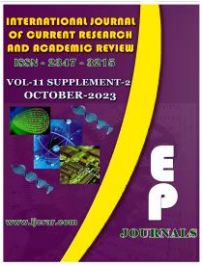

Checking the temperature stability of microencapsulated probiotic bacteria

The stability of the microencapsulated powder at elevated temperature was evaluated.0.1gof microencapsulated powder was added into 5ml of distilled water in three separate test tubes. The three sample test tubes were kept inside a water bath at 50^0C, 75^0C, 100^0C for 1 hr followed by cooling down in an ice water bath to reach the ambient temperature **(**Doost *et al.,* 2018). Each of the three samples were serially diluted and 10^{-1} dilution was taken and uniformly spread on the nutrient agar. It was incubated at 37^0C for 24hrs and its viability was checked (CFU/ml).

Evaluation of prebiotic properties of the almond gum

To 50ml of distilled water, 0.5g of NaOH and 1g almond gum power was added and mixed properly. It was kept in a stirrer at 260 rpm in a room temperature overnight. It was centrifuged at 3000rpm to collect the supernatant. To the supernatant, 16 ml of Ethanol and 24 ml of Isopropanol was added and mixed well. It was refrigerated for 12 hrs **(**Doost *et al.,* 2018). Next day the sample was collected and carbohydrate test was performed.

Carbohydrate test with phenol sulfuric method

The carbohydrate content was determined by phenol-sulfuric acid method using D- glucose as a standard described by Dubois *et al.,* 1951. To seven clean, dry test tube for phenol sulfuric acid method. The dilution of glucose standards was prepared in the concentration 100, 200, 300, 400 and 500 µg per 500 µl by transferring the appropriate amount of glucose from the standard glucose solution (1mg/ml) and diluting it with distilled water to a total volume of 500 µl. Each tube was filled with 0.2 ml, of a 5% phenol solution and 1ml of pure sulfuric acid and mixed well and incubated at room temperature.

The contents of the tubes was mixed after 10 minutes and placed in a water bath at 100^0C for 20 minutes. The spectrometer was turned on and 490 nm was chosen as the wavelength. The blank was set at zero in the absorbance (OD). A standard curve of absorbance at 490 nm versus glucose concentration in 500 ml was plotted on the "Y" axis. The unknown value "X" was recorded from the graph that corresponds to the OD reading of the test sample.

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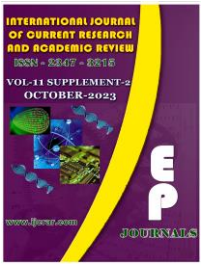

Results

Isolation of probiotic organisms from BIFILAC® sachet

The contents of BIFILAC® Sachet were grown in MRS plates. The out of the 4 organisms, *Bacillus mesentricus* was selected for further studies. Based on the biochemical test results the isolated organism was identified to be *Bacillus mesentricus*.

Estimation of its swelling index

Test for Swelling index

Swelling index wereCalculated according to the formula:

$$\text{Swelling index} = \frac{\text{Final volume- Initial volume}}{\text{Final volume}} \times 100$$

$$\text{The swelling index at Acidic pH} = \frac{10.29-0.43}{10.29} \times 100 = \mathbf{6.11g}$$

$$\text{The swelling index at Neutral pH} = \frac{17.01-0.45}{17.01} \times 100 == \mathbf{14.36g}$$

$$\text{The swelling index at Alkaline pH} = \frac{11.89-0.39}{11.89} \times 100 = \mathbf{8.60g}$$

Swelling index for almond gum at different pH were calculated. Upon Comparison to acidic and alkaline conditions, the neutral pH showed higher swelling index of **14.36g.** Hence higher water holding capacity was observed at neutral pH.

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Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Microencapsulation of probiotic bacteria in almond gum

Encapsulation of the probiotic isolate *Bacillus mesentricus* inside Almond gum was performed. The almond gum was then dried at 40^0C for 72 hr. A brownish colored almond gum powder was obtained (Fig. 1).

Fig.1 Dried microencapsulated probiotic bacteriain almond gum.

Viability of probiotic organism after 5 days in different pH range were observed and tabulated (Table 1). The CFU for each pH range were calculated according to the formula.

$$\text{CFU/ml} = \frac{\text{(No. of colonies} \times \text{Dillution factor)}}{\text{Volume of culture plate}}$$

Table.1 Calculating the CFU value of the pH 3-pH 11.

S.No.	pH ranges	Value of the CFU
1	pH 3	120×10^{-1}CFU/ml
2	pH 5	128×10^{-1}CFU/ml
3	pH 7	Too numerious too count
4	pH 9	Too numerious too count
5	pH 11	Too numerious too count

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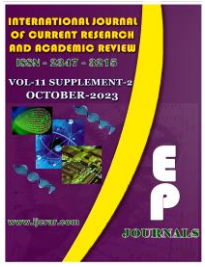

Checking the temperature stability of microencapsulated probiotic bacteria

The stability of the microencapsulated powder at elevated temperature was also evaluated and tabulated (Table 2).Viability of the probiotic organism at different temperatures was observed. CFU for each temperature range was calculated according to the formula:

$$\text{CFU/ml} = \frac{\text{(No. of colonies} \times \text{Dillution factor)}}{\text{Volume of culture plate}}$$

Table.2 Calculating the value CFU different temperature range

S. No.	Different temperature	Value of the CFU
1	Temp 50^0C	Too numerous to count
2	Temp 75^0C	Too numerous to count
3	Temp 100^0C	Too numerous to count

Evaluation of prebiotic properties of the almond gum

The phenol-sulfuric acid method was used to give reliable estimations of the sugar content of the prebiotic sample. The amount of color produced at a constant phenol concentration is proportional to the amount of sugar present. The standard curve was obtained by plotting the sugar concentration vs the absorbance (Graph 1)
Concentration of the unknown sample was calculated as per the formula:

$$\textbf{Concentration of unknown sample} = \frac{\textbf{Absorption of unknown}}{\textbf{Absorption of standard}} \times \textbf{Concentration of standard}$$

$$= \frac{1.28}{1.22} \times 0.75$$

The concentration of unknown sample was =**0.78mg/ml**

EXCELLENT PUBLISHERS

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Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

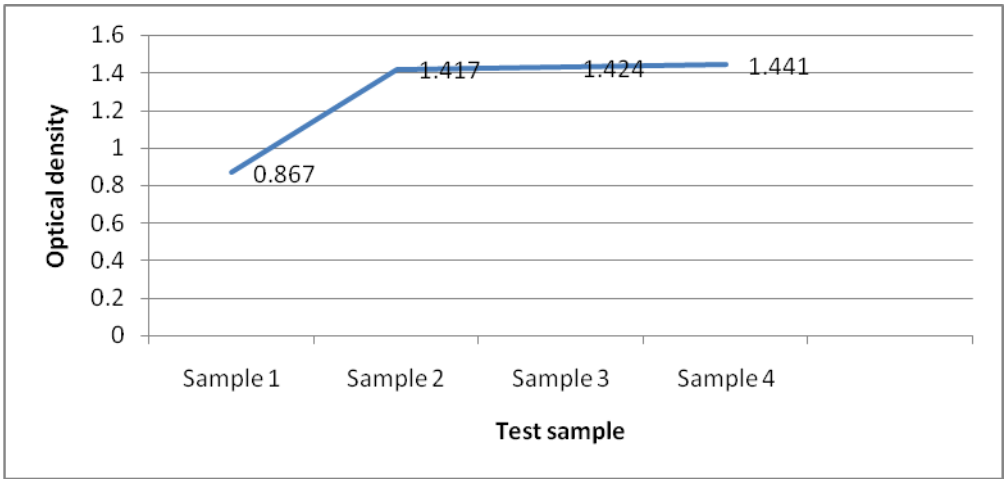
Calculation the Yield of the sample as per the equation

$$\text{Yield} = \frac{\text{Concentration of unknown}}{\text{Volume}} \times 100$$

$$= \frac{0.78}{40} \times 100$$

The calculation shows the extraction yield of Almond gum = **1.95 ± 0.78%.**

Graph.1 Carbohydrate test by Phenol sulphuric method



Discussion and Conclusion

The present study attempted the collection and characterization of Indian *Prunus dulcis* gum exudates for its microencapsulation efficiency. *Bacillus mesentercius* was isolated from BIFILAC. Biochemical analysis was done to verify if the colonies represent *B. mesentricus*. The biochemical tests confirmed the colonies from plates with MRS medium as *B. mesentricus*. Previous study by Chavali Kavyasudha *et al.,* 2017 had reported similar results from BIFILAC sachet. The swelling index represents the increase in the volume of polymeric substance and it is an indication of its disintegration ability. Almond gum powder showed a difference in swelling index in different pH

EXCELLENT PUBLISHERS

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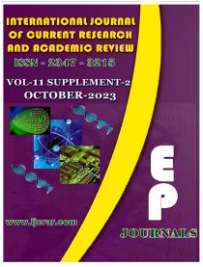

level condition. Neutral pH showed higher water holding capacity of 17.01±0.45 than acidic pH which showed a lower water holding capacity of 10.29±0.43 and alkaline pH shows moderate water holding capacity of 11.89±0.39. This shows almond gum has hydrogel properties. UzmaFraooq *et al.,* 2014 showed swelling index of almond gum to be high indicating that almond gum might have a good water taking capacity.

The improved encapsulation efficiency can be related to two facts: firstly, the higher solubilization of *B. mesentericus* and secondly, the almond gum has higher water holding capacity, which can hence entrap both substance and improving the viability and stability. Probiotic bacteria was encapsulated with almond gum and dried. The viability of *B. mesentericus* encapsulated with almond gum at different pH concentration was checked. There was maximum viability. The stability of the microencapsulated powder at elevated temperature was also evaluated. Viability of the probiotic organism at different temperature was observed on a nutrient agar plate. Colonies were viable in a different temperature plate. This behavior was previously reported in another study by Lopez- Rubio *et al.,* 2012.

Colorimetric tests for reducing sugars and polysaccharides have been known for a considerable time. The phenol-sulfuric acid method was used to give reliable estimations of the sugar content in almond gum. Oral administration of live probiotics along with prebiotics has been suggested with numerous beneficial effects for several conditions including certain infectious disorders, diarrheal illness, some inflammatory bowel diseases. Though delivery of such viable bacteria to the host intestine is a major challenge due to poor survival of the ingested probiotic bacteria during the gastric transit, especially within the stomach where the pH is highly acidic, microencapsulation has been known as a promising approach for improving the viability of probiotics in the human digestive tract. The microencapsulation technologies used for delivery of probiotics towards better stability and viability, as well the incorporation of co-encapsulated probiotics and prebiotics in functional/ symbiotic dairy foods. The result of the current study about the encapsulation of *B.mesentericus* in almond gum gel has been promising. Further standardization of this technology can prove to be a viable alternative, to maintain the stability of these bacteria in both storage and passage through the gastrointestinal tract. The inclusion of other adjuvant materials may improve the viability of these organisms and makes the technique more efficient.

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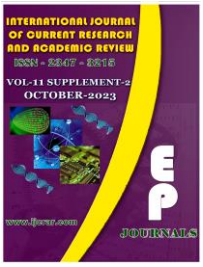

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EXCELLENT PUBLISHERS

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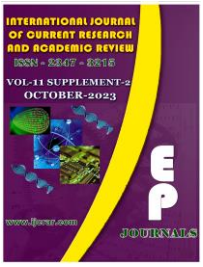

Full Length Article **IJCRAR/FL/79**

Deep Learning for Crystal Structure Prediction

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Abstract

Crystal structure prediction involves identifying the most stable crystalline configurations of materials based on their chemical compositions. Analyzing the chemical composition of materials becomes significantly more informative when we have to access structural data like crystal systems. Identifying flawed crystal structures can assist in rejecting these defective arrangements, thereby reducing industrial defects. Solving structural problems can be a challenging and time-intensive endeavor. In this work, deep-learning models aimed at ascertaining the structural type of materials solely based on their compositions. This paper introduces a deep learning model designed for highly accurate detection of crystal structures, featuring a classification component for predicting the specific crystal structure. To forecast crystal structures, an array of deep learning models was employed, including AlexNet, ResNet, artificial neural networks (ANN), and recurrent neural networks (RNN).The model is employed to autonomously pick a group of template crystals from a database of crystal structures. These templates possess highly similar stable structures, to which intend to apply element substitution, for a given query composition with an unfamiliar crystal structure. In this work, tests on various deep learning models and found that AlexNet outperforms the others.

Keywords: Artificial Neural Network (ANN), AlexNet, Crystalline, Prediction, Recurrent Neural Networks (RNN), ResNet.

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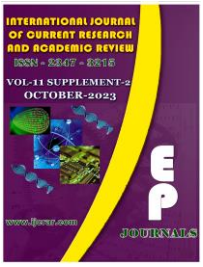

Introduction

Crystals have a vital significance in the field of materials science, specifically when it comes to understanding the chemical composition and crystal structure. Due to the significance of atomic arrangement in both theoretical and experimental materials science, a productive approach to categorizing crystals involves identifying the set of all transformations that do not alter the system. The growing global energy demand necessitates the identification of new functional materials through the exploration of the extensive chemical landscape.

Within this vast realm, a significant subset is represented by crystalline materials. The key to effectively discovering crystal materials with specific desired traits relies on optimizing the efficiency of navigating this chemical space. Anticipating the crystal structure corresponding to a particular chemical composition before conducting experimental synthesis has garnered notable attention within the condensed matter science.

The characteristics of molecular crystals, encompassing both their physical attributes and bioactive properties, are intricately linked to the precise particulars of their crystal structure. Forecasting crystal structures based solely on fundamental connectivity information of a molecule, such as its chemical diagram, poses a significant computational chemistry challenge. The precise computational anticipation of crystal material structures holds numerous significant applications. Utilizing it for computationally uncovering new functional materials holds immense potential to revolutionize diverse industries and catalysts.

Crystal structure prediction (CSP) stands as one of the most auspicious methodologies for the exploration of novel materials. Additionally, crystal structure prediction plays a significant role in the domain of crystal engineering, which revolves around the deliberate creation and synthesis of molecular solid-state structures possessing specific sought-after properties.

Among the uncomplicated and extensively employed techniques for crystal structure prediction (CSP) is the template-based or element substitution method. This strategy entails initially identifying an existing crystal structure with a comparable formula and subsequently substituting specific atoms with different element types.

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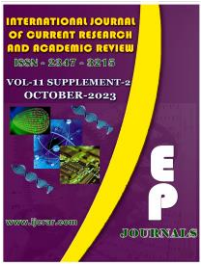

Anticipating the crystal structure of a material based on its constituent elements represents a pivotal initial stride in the realm of computational materials design. This is due to the fact that a material's structure plays a decisive role in determining a multitude of its observable properties. The task of projecting a material's structure can be distilled into the challenge of discovering the atom arrangement that minimizes the overall energy of the structure.

Deep learning is an artificial intelligence technique that imparts computers with the capacity to process data akin to how the human brain functions. Through this approach, intricate patterns within images, text, audio, and diverse datasets can be discerned by deep learning models, leading to precise predictions and valuable insights. Deep learning constitutes a subset of machine learning dedicated to training artificial neural networks. These networks acquire the ability to execute tasks through the assimilation of substantial data, thereby enhancing their performance. Predicting the crystal structure of diverse materials posed a significant challenge for researchers in the solid-state materials field. However, this challenge has more recently been overcome, as a few studies have highlighted the benefits of employing deep learning techniques in crystal structure prediction through representative learning approaches. Applying deep learning to predict crystal structures entails the utilization of sophisticated computational methods to anticipate the organization and characteristics of crystalline substances. This strategy leverages the capabilities of artificial neural networks and deep learning frameworks to decipher intricate patterns inherent in crystal structures, leading to enhanced precision in predictions and a deeper understanding of material properties. In this work, employed diverse deep learning classification models to identify crystal structures. The aim was to predict crystal structures for four primary compound types: cubic, tetragonal, orthorhombic, and rhombohedral. The research focused on developing distinct deep learning models, namely AlexNet, ResNet, RNN, and ANN, for crystal structure prediction. The effectiveness of these models was evaluated in terms of accurately predicting crystal structures to determine the optimal performer.

Literature review

Angelo Ziletti *et al.,* [1] proposed a machine learning-based method to categorise structures by crystal symmetry automatically. a dataset with more than 100,000 generated crystal structures,

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Journal home page: http://www.ijcrar.com

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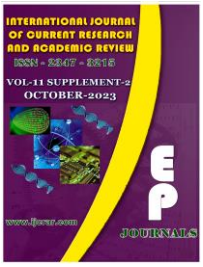

some of which were severely flawed. By computing a diffraction image, the crystals are represented. Next, a deep learning neural network model is built for categorization.

Sungwon Kim *et al.,* [2] developed a generative adversarial network for crystal structures using a crystal representation that is inversion-free based on unit cells and fractional atomic coordinates. For high-throughput virtual screening (HTVS), the suggested approach is used to create Mg-Mn-O ternary materials and theoretically assess their photoanode capabilities. The generative HTVS framework that has been proposed predicts 23 novel crystal structures with predicted band gap and stability that are plausible. These results imply that the generative model can be a useful tool for uncovering hidden chemical space.

Guanjian Cheng *et al.,* [3] reported a machine-learning approach for crystal structure prediction in which an optimisation algorithm (OA) is used to speed up the search for the crystal structure with the lowest formation enthalpy and a graph network (GN) is used to establish a correlation model between the crystal structure and formation enthalpies at the given database. Three optimisation algorithms, including random searching (RAS), particle-swarm optimisation (PSO), and Bayesian optimisation (BO), are used to forecast crystal structures at a certain number of atoms in a periodic cell. These databases include the open quantum materials database (OQMD) and Matbench (MatB).

Michael Kilgour *et al.,* [4] proposed machine learning methods for expediting crystal property prediction and ranking of molecular crystal structures utilising geometric deep learning tools on molecular graphs. On a sizable and varied test data set, the MolXtalNet-D density prediction model performs better, with a mean absolute error of less than 2%.

David McDonagh *et al.,* [5] developed a strategy to quickly enhance force field lattice energies by forecasting these corrections with machine learning and correcting two-body interactions with a higher level of theory in a fragment-based approach. Where the rigid molecule model is applicable, corrected lattice energies with widely utilised density functionals and second order perturbation theory (MP2) all considerably enhance the ranking of experimentally known polymorphs. Our confidence in the energetic ordering of anticipated crystal structures will grow as a result of the QM fragment-corrected force field lattice energy models.

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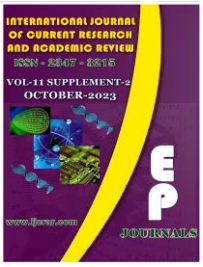

Hu, Jianjun *et al.,* [6] the reconstruction of crystal structure (atomic coordinates) based on atomic contact maps, the CMCrystal algorithm, based on global optimisation, was suggested. In this method, machine learning models can be taught to anticipate the physical, chemical, or geometric constraints like the atomic pair contact maps and space group, as well as the lattice parameter, which can subsequently be used to reconstruct the coordinates of the atom.

Jianjun Hu *et al.,* [7] developed AlphaCrystal, a crystal structure prediction system that combines a deep residual neural network model for forecasting the atomic contact map of a target material with genetic algorithms to reconstruct a three-dimensional (3D) structure. Our AlphaCrystal algorithm can predict structures that are reasonably near to the ground truth structures, according to extensive studies on 20 benchmark structures. This allows it to handle relatively big systems and greatly speed up crystal structure prediction.

ShreyasHonrao *et al.,* [8] suggested a machine learning method to compute compounds' relaxed and unrelaxed formation energy in relation to the ground state crystal structure of the pure components in the context of binary system structure predictions. In this, the kernel ridge regression and support vector regression kernel-based learning techniques are examined. Through the composition and structural space, these approaches offer minimal root-mean square prediction errors of around 20 eV/atom. Our Genetic Algorithm for Structure Prediction (GASP) produced a dataset of about 14,000 Li-Ge structures.

V. Bhuvaneswari *et al.,* [9] the potential of proposed Deep Learning techniques is discussed, along with how they differ from traditional Machine Learning techniques. Studies that used deep neural network (DNN) techniques trained on vast amounts of crystallographic big data to determine a material's crystal structure were also mentioned.

Yuta Suzuki *et al.,* [10] shown that the self-supervised deep learning approach can successfully learn material embeddings from crystal structures of over 120 000 materials, without any annotations, to capture the structure-functionality links among materials. From the unannotated structural data, these embeddings demonstrated the striking similarities between materials, or "materials concepts," such as cuprate superconductors and lithium-ion battery materials.

EXCELLENT PUBLISHERS

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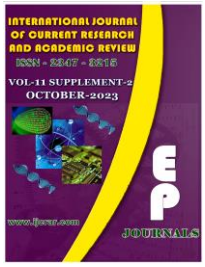

Methods

Deep learning constitutes a division of machine learning centered around the architecture of artificial neural networks. These networks, known as ANNs, utilize layers of interconnected nodes referred to as neurons, functioning cohesively to process data inputs and glean insights.

In the context of a fully connected deep neural network, an arrangement involves an initial input layer succeeded by one or more hidden layers. Each neuron within this setup obtains input from preceding layer neurons or directly from the input layer. Subsequently, the output generated by one neuron serves as input for other neurons situated in the subsequent layer of the network.

This sequential progression persists until the ultimate layer produces the conclusive output of the entire network. Through these interconnected layers, the neural network undertakes a series of nonlinear transformations on the input data, enabling the acquisition of intricate representations of said data.

Residual Network (ResNet)

To address the challenge of the vanishing or exploding gradient problem, this architecture introduced a novel concept known as Residual Blocks. Within this framework, a technique called skip connections is employed. These connections link the activations of one layer to subsequent layers, effectively bypassing certain intermediary layers. This arrangement gives rise to what's called a residual block. By assembling these residual blocks, the architecture of ResNets is constructed.

The fundamental idea behind this approach is a departure from conventional layers that aim to directly learn the underlying mapping. Instead, the network is designed to adjust a residual mapping. In essence, rather than striving to directly capture the mapping H(x) as the initial process, the network is encouraged to refine and adapt the residual mapping.

Defining a function as F(x) := H(x) - x leads to the reciprocal expression H(x) := F(x) + x.

International Journal of Current Research and Academic Review
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Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

AlexNet

AlexNet introduced a more extensive and intricate convolutional neural network (CNN) model in comparison to LeNet and emerged victorious in the formidable ImageNet Large Scale Visual Recognition challenge, which is renowned for visual object recognition. This achievement marked a groundbreaking moment in the realms of machine learning and computer vision, as AlexNet achieved unprecedented recognition accuracy, surpassing all established machine learning and computer vision methodologies. This pivotal milestone in history catalyzed a rapid surge in interest and enthusiasm for deep learning, particularly in the context of visual recognition and classification tasks.

Recurrent Neural Network (RNN)

A recurrent neural network (RNN) is a specialized type of neural network designed to handle sequences of data, denoted as $x(t) = x(1),..., x(\tau)$, where the time step index t ranges from 1 to τ. When dealing with tasks involving sequential inputs like speech and language processing, RNNs are often a more suitable choice.

In the context of a Natural Language Processing (NLP) problem, such as predicting the next word in a sentence, having knowledge of the preceding words is crucial. The term "recurrent" in RNN stems from their ability to perform a consistent operation for each element within a sequence. The output of an RNN is influenced by previous computations, indicating a form of dependency. Alternatively, one can conceptualize RNNs as possessing a form of "memory" that retains information regarding past calculations.

Artificial Neural Networks (ANNs)

Artificial Neural Networks (ANNs) are computational algorithms inspired by the functioning of the human brain, utilized for intricate pattern modeling and predictive tasks. Stemming from the concept of biological neural networks in the human brain, ANNs, particularly the deep learning variant, have emerged. The motivation behind developing ANNs was an attempt to mimic the operations of the human brain. While ANNs share substantial similarities with biological neural

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

networks, they are not exact replicas. Notably, ANNs exclusively process numeric and structured data.

In contrast, Convolutional Neural Networks (CNNs) and Recursive Neural Networks (RNNs) find utility in handling unstructured and non-numeric data types, including images, text, and speech. However, this article exclusively concentrates on the discussion of Artificial Neural Networks.

Results and Discussion

This study involved using Python to develop machine learning models and perform calculations for predicting crystal structures based on crystal structure prediction data. The process utilized appropriate libraries for classification.

The algorithm was trained using a dataset comprising 5330 unique entries, serving as a comprehensive resource for training and testing crystal structure prediction models. The four deep learning models were put into practice, Alexnet, ResNet, Artificial Neural Networks (ANN), and Recurrent Neural Networks (RNN).

Python and machine learning libraries were employed to facilitate the training of these algorithms. Utilizing the trained classifier post pre-processing, the data was categorized into cubic, tetragonal, orthorhombic, and rhombohedral crystal structures. The crystal structure prediction result table shows below.

Table.1 Performance of Crystal Structure Prediction

Sl. No.	Models	Accuracy
1	ResNet	78.69%
2	**Alexnet**	**82.29%**
3	Recurrent Neural Networks (RNN)	61.55%
4	Artificial Neural Networks (ANN)	71.69%

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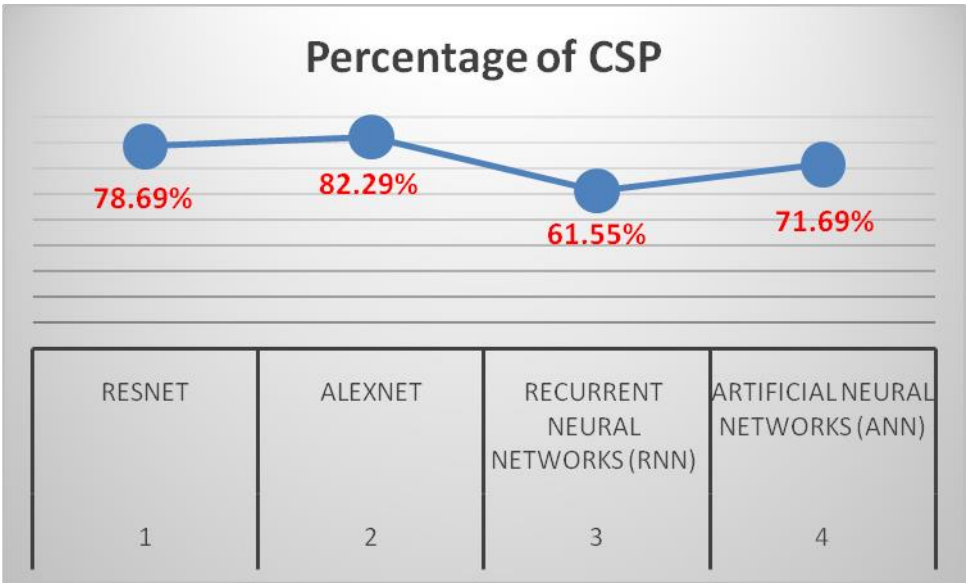
Fig.1 Percentage of Crystal Structure Prediction



Conclusion

This paper, the capability of deep learning models to serve as efficient, enabling the accelerated identification of crystal structure predictions. This research study centered on the classification of crystal structure predictions. We examined, tested, and introduced methodologies for predicting Crystal Structures using Deep Learning models. The study incorporated four distinct deep learning models: AlexNet, ResNet, ANN, and RNN. Notably, AlexNet demonstrated superior performance in this investigation. For classification, the ResNet, ANN, and RNN models achieved accuracies of 78.69%, 71.69%, and 61.55% respectively. Ultimately, AlexNet emerged as the most accurate predictor of crystal structure, achieving an accuracy rate of 82.29%. Enhancing accuracy across diverse deep learning models for crystal structure prediction remains a focus for future research endeavors.

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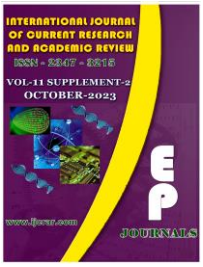

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International Journal of Current Research and Academic Review

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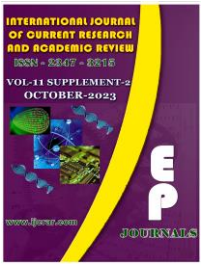

Full Length Article **IJCRAR/FL/80**

Navigating Federating Learning: Challenges and Applications - A Comprehensive Survey

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Abstract

This paper presents a comprehensive overview of Federated Learning (FL), a secure distributed machine learning approach designed to address data fragmentation issues while preserving data privacy. The document discusses the challenges that impact FL's performance and effectiveness in practical applications across five main areas: FL fundamentals, privacy and security measures, communication overhead issues, challenges posed by heterogeneous environments, and real-world applications of FL. It also explores potential future research directions in FL to further support privacy-conscious applications.

Keywords: Federated learning, • Machine learning, • Privacy protection, • Personalized federated learning.

Introduction

Since the inception of artificial intelligence (AI) in 1956, AI technology has significantly impacted human life. Recent advancements in AI have led to its integration into various application fields. In AI development, the focus has been on improving models, computing power, chip performance, and other technical aspects to facilitate continued progress. To achieve human-level thinking in machines, extensive real-world data is required for training. Federated learning (FL) emerged to address these challenges. Initially designed for Android mobile users to update

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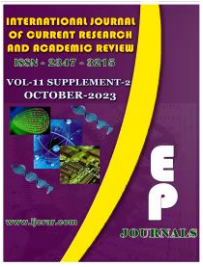

models privately, Google later implemented FL with Federated Average (FedAvg) algorithms on mobile devices. This enabled federated analytics, preserving privacy while monitoring large-scale equipment statistics. FL has gained prominence in privacy computing due to its lightweight technology and deployment advantages, becoming a leading solution in privacy computing scenarios, driving research advancements.

Federated Learning (FL) is a secure distributed machine learning technique where algorithms are collaboratively run on scattered edge devices or servers. It ensures privacy by keeping data local and only sharing model parameters. The server aggregates parameters for global updates, saving resources. FL outperforms centralized methods, allowing multiple agencies to build unified models securely. It enables data fusion, expands sample sizes, and enhances data dimensionality, supporting big data applications and societal development.

The paper offers a comprehensive survey and meticulous analysis of the most recent research papers in the domain of FL.

It delves deeply into the practical application potential of FL and intricately examines the hurdles encountered during the practical implementation of this technology. Furthermore, it presents distinctive perspectives on the current state of development and the future possibilities within the field of FL.

The remainder of the paper is structured as follows: Section 2 provides an introduction to the fundamental concepts of Federated Learning (FL). In Section 3, the paper explores the privacy and security threats that pose challenges to FL. It conducts a comprehensive survey and empirical evaluation of methods designed to mitigate these threats. Section 4 focuses on the communication challenges inherent in FL and reviews various efficient communication mechanisms to address them. In Section 5, the paper delves into solutions for addressing the issue of heterogeneity in FL.

Fundamentals of Federated Learning

In this section, we provide an extensive overview of the core principles underpinning Federated Learning (FL), including its essential concepts, training framework, and categorization.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

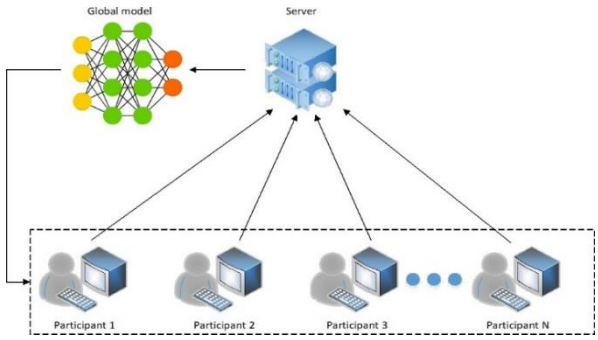
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

A Summary of Federated Learning

Federated Learning (FL) stands as a secure and decentralized learning framework uniquely designed to tackle the challenge of collaborative learning among widely dispersed clients without the necessity of exposing their raw data [21]. Within this framework, a virtual model is meticulously crafted, serving as the optimal global model for amalgamating data contributions from all participants. Each participant, in turn, leverages this virtual model to advance their individual local objectives. Remarkably, FL achieves outcomes closely mirroring those of conventional centralized training models [22], where data from multiple clients converges in a central server for model training. In the federated approach, it is generally assumed that participants share identical identities and endorse the establishment of shared data policies. Crucially, as data is never directly transferred between participants, it leaves no imprint on data specifications and preserves user privacy unscathed.

Fig.1 The basic frame work of FL



To elucidate the core essence of FL, let us define N participants within the FL ecosystem, each harboring the desire to contribute their data (P1, P2,..., PN) to the collective training of a global model. A frequently adopted strategy involves pooling all these data sets into a single unified dataset denoted as P = P1 ∪ P2 ∪ · ·· ∪ PN. From this consolidated dataset, a model Msum is trained, yielding a performance metric Vsum. In the federated context, participants engage in the collaborative training of a shared model Mfed, yielding a performance measure of Vfed, all the

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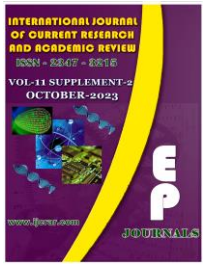

while ensuring that no participant discloses its private data to others. With ε denoting a non-negative value, we can express the performance gap of the FL model as:

$|Vfed - Vsum| < \varepsilon$ ((1))

The FL learning process revolves around the minimization of a loss function, computed individually on each client through a weighted aggregation method. The overarching objective of FL is encapsulated in the following mathematical expression (2):

$\text{minimize } f(w) = \sum_{k=1}^{nk} F(w)$ ((2))

The Classification of Federated Learning

Federated Learning (FL) encompasses three main categories based on the characteristics of client datasets:

Horizontal Federated Learning (HFL)

In HFL, client datasets share more common data features than users. It focuses on data alignment by extracting parts of participants with common users but distinct characteristics for joint training.

Vertical Federated Learning (VFL)

In contrast to HFL, VFL deals with datasets where client characteristics differ significantly. Here, the overlap of users is greater than that of data features, resulting in each client dataset having more shared users but few duplicated data features.

Federated Transfer Learning (FTL)

FTL addresses scenarios where participants have highly distinct datasets, making HFL and VFL impractical. FTL enables the creation of an effective global model with limited data and labels

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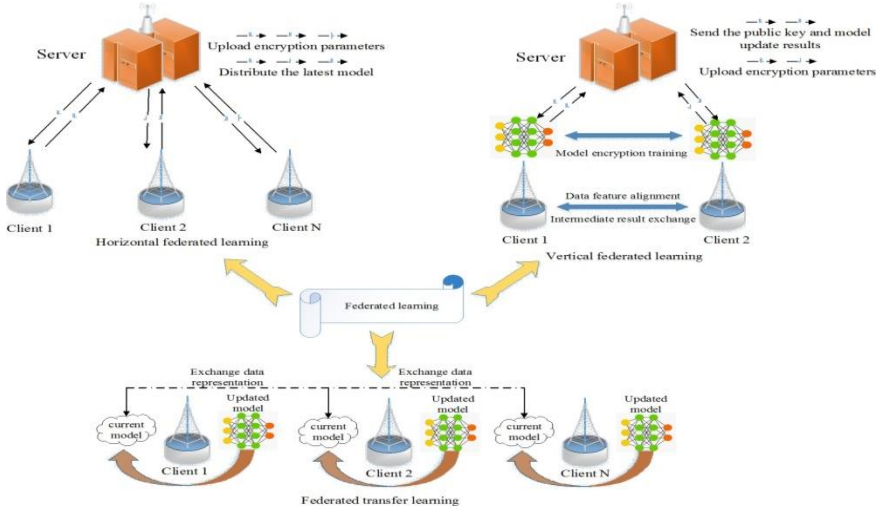
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

while adhering to data privacy regulations. It focuses on learning from a source domain to a target domain based on data or model similarities among participants.

FTL typically involves using tags from the source domain to predict target domain accuracy in many applications.

Fig.2 Federated Transfer learning



Techniques for Ensuring Privacy in Federated Learning

These categorizations allow FL to tackle various practical challenges efficiently.

Before the advent of Federated Learning (FL), preserving privacy in machine learning was a prominent research topic. FL, as an innovative technology, builds upon previous privacy protection techniques. It offers a security mechanism to safeguard data privacy by securing model transmission while preserving local sensitive data. However, even with FL's security measures in place, various types of attacks can still target the FL system, posing threats to its reliability and the data privacy of participants.

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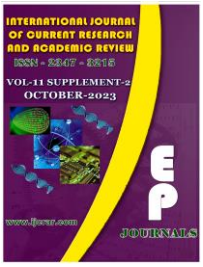

Secure Multi-Party Computing (SMC)

Secure Multi-Party Computing (SMC) was initially introduced in 1982 with Yao's Millionaire problem, primarily for safeguarding input data during cooperative processes. SMC employs encryption to protect sensitive data exchanged among parties, ensuring that parties maintain control over their own data. Sharemind is an advanced SMC framework that allows data processing without revealing it. In the context of Federated Learning (FL), SMC has evolved to protect sensitive data by encrypting parameters. It's used in privacy-preserving FL frameworks, securely aggregating client parameters while remaining robust to client exits. Although SMC-based FL models involve communication costs, they are computationally efficient due to the smaller parameter sizes relative to data.

Differential Privacy (DP)

Differential Privacy (DP) addresses threats where malicious servers might infer group characteristics from encrypted user data, known as differential attacks. DP adds random noise to the data, preventing attackers from recovering the original information. DP protects computational results rather than the process itself and is theoretically robust against any attack. In FL, DP is applied to protect federated models. Researchers have developed FL models that integrate DP, achieving a balance between privacy and model performance. DP-based FL methods focus on adding noise to parameter information, minimizing communication and computational costs.

Security Challenges and Solutions in Federated Learning

Securing Federated Learning (FL) is crucial, distinct from privacy. FL faces various attacks, primarily poisoning and Byzantine attacks, impacting both model and data integrity.

Poisoning Attacks

Data Poisoning

Malicious actors manipulate local client data in FL, making detection challenging due to distributed nature. Approaches like outlier detection based on data similarity have been proposed, along with blockchain-based verification to prevent data poisoning.

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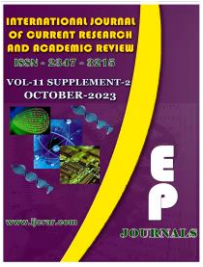

Model Poisoning

Attackers inject hidden functionality into federated models, undermining their performance. Defenses include generating audit data through adversarial networks and eliminating malicious models based on audit accuracy. Federated exception analysis enhances active defense in FL.

FL's distributed nature and larger attack surface require robust detection and defense methods to secure federated and local models effectively.

Byzantine attacks

A key security concern in Federated Learning (FL), involve collusion by malicious clients to disrupt the global model. Researchers have developed credibility-based approaches and reliability assessment methods to detect and defend against such attacks, ensuring the integrity of FL models in distributed learning environments.

Optimizing Federated Learning Algorithms

Federated Learning (FL) hinges on local model quality. Research shows that increasing local iterations while decreasing communication rounds improves global model convergence. The FedAvg algorithm initially reduces communication by emphasizing local training. However, as models near convergence, it becomes less effective. Researchers are exploring FL algorithm optimization, including momentum gradient descent and adaptive learning rates. Optimizing aggregation methods can also boost FL efficiency, exemplified by the federated adaptive weighting algorithm. These optimizations target quicker global model convergence, fostering efficient communication.

Heterogeneity Challenge in FL

In Federated Learning (FL), heterogeneity poses challenges in both data and model aspects. Data heterogeneity arises due to clients' varying data volumes and distributions, affecting global model convergence. Solutions include workload scheduling and data quality prioritization. Model

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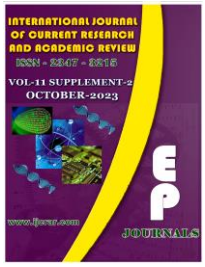

heterogeneity results from differing client resources, impacting local model structures. Resolving these issues is crucial for effective FL training and applications, with personalized approaches, scheduling algorithms, and federated Kalman filters helping to mitigate the impact of heterogeneity on FL processes.

The Application of FL

In the era of big data, safeguarding data privacy and security is crucial across industries. Federated Learning (FL) has emerged as a pivotal technology addressing these concerns

Federated Learning in Healthcare

In healthcare, where patient data privacy is paramount, FL plays a vital role. Each hospital acts as an individual client, training models locally with patient data, encrypting and uploading model information to a central server for global model updates.

This approach has been applied to create robust disease detection models, including those for COVID-19 and cancer. FL empowers healthcare applications while ensuring patient data privacy. The fusion of FL and the medical industry advances healthcare intelligence while preserving sensitive patient information.

Federated Learning in Finance

The financial and insurance sectors are increasingly using Federated Learning (FL) for risk assessment, marketing, and anti-money laundering. FL enables collaborative model training across different institutions while safeguarding data privacy.

For example, WeBank has applied FL to enhance risk management for small business credit and personal loans, improving credit scoring and insurance claim predictions. These FL applications are still in the early stages of adoption but hold promise for advancing privacy-preserving financial and insurance services.

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Journal home page: http://www.ijcrar.com

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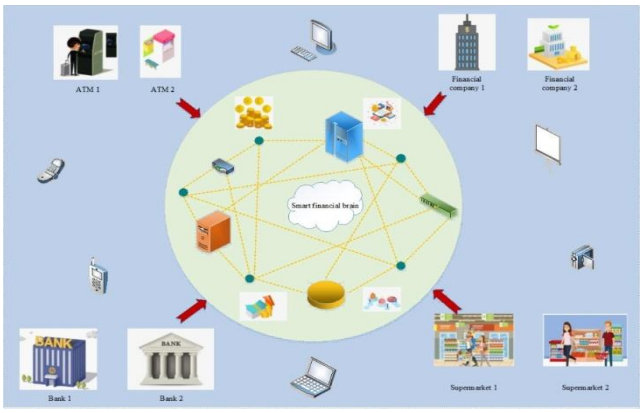
Fig.3 Federated learning in Finance



Conclusion

Federated Learning (FL) has emerged as a vital solution for privacy protection and has witnessed rapid development in recent years. Researchers have extensively explored FL, delving into its fundamental principles, frameworks, and strategies to tackle associated challenges. This comprehensive overview summarizes the current state of FL research, providing insights into its concept, developmental challenges, and its integration with various applications. The paper encourages scholars to gain a deeper understanding of FL's potential and challenges, offering valuable support for its continued advancement. Future FL research will prioritize privacy and security mechanisms, client collaboration models, fairness, robustness, and personalized FL approaches, promoting its deployment and broader application.

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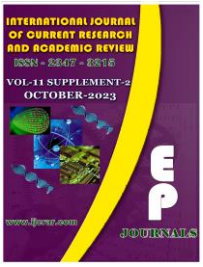
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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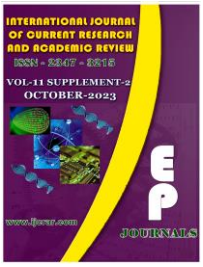

Full Length Article **IJCRAR/FL/81**

Application of Statistics

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Abstract

Statistical analyses are an important part of experimental and clinical studies. These analyses must be carefully performed, and clearly described. Authors should present enough information about these analyses to allow readers to evaluate the analyses, determine their appropriateness, and, with that information in mind, assess the validity of each study's results. It is somewhat paradoxical that many errors in this area involve basic rather than advanced statistics. Most journals begin articles with abstracts that summarize the key elements of each study. Abstracts should present enough statistical information for the reader to determine the robustness of each study's main findings.

Keywords: Statistics, Mathematics, account handling, planning, drawing pattern organising and interpreting the data.

Introduction

Statistics

Statistics is the science concerned with developing and studying methods for collecting, analysing, interpreting and presenting empirical data.

Importance of Statistics

Statistics is the branch of Mathematics which deals with processing, collecting, evaluating, planning and presentation of data. A statistician is the professionals who have the core

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

knowledge of the key concepts of Statistics and is well versed with account handling, planning, drawing pattern organising and interpreting the data. At rudimentary level, the main aim is to draw conclusions based on meaningful analysis of information. The application of statistics is measured by grater scale and may take months or even years to conduct the epidemiological and statistical analysis which are based on laws, schemes, and plans, strategies and simple mathematical principles.

Stages Involved in Statistical Process

When it comes to the application of statistics a proper process is followed by statisticians to enhance and optimize the results of information analysis using adaptive methodologies. Enlisted are major stages and methodologies involved in completing the statistical process.

Presenting the data

The set of arrangements or combinations used to present the data outlook and data characteristics. Presentations can make findings more compelling and persuasive in the form of diagrams, charts, and various illustrations to show relationships between data.

Interpreting the data

One of the most important stages in statistics. Interpretation deal with data rendering and data evaluation whose outcomes is supported by mathematical reasoning and pre-planned standard of procedures.

Applications of Statistics

Now you know the steps included in the statistical process it, however, becomes important to know the Application of statistics and its associated fields enlisted below:

- Research Interpretations and Conclusions
- A meta-Analysis of Literature Reviews
- Clinical Trial Design
- Designing Surveys
- Epidemiological Studies

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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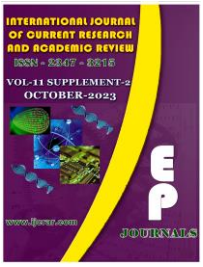

- Statistical Modeling
- Government Agencies
- Science and Medicine
- Psychology
- Education
- Corporate Sectors
- Health Sector
- Public Surveying
- E-commerce and trade
- Weather Forecast
- Financial Markets
- Predicting Diseases
- Political Campaigns
- Robotics
- Aerospace
- Data Mining
- Deep Learning
- Machine Learning
- Business Statistics
- Sports

Application of Statistics in Statistical Modelling

Statistical modelling involves developing predictive models based on design, pattern perception and data development. Modelling is widely used in prediction of election results, survival analysis of populations and scientific surveys. These tools are used by Meteorologists to predict the weather and to the study different environmental and geographical disturbances in the earth.

Application of Statistics in Government Sectors

As a regulatory body, government decisions are mostly outcomes of well-researched statistics and figures on which decisions are made related to health, populations, education, and development. It may administer research on education to monitor the improvement of college students.

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International Journal of Current Research and Academic Review

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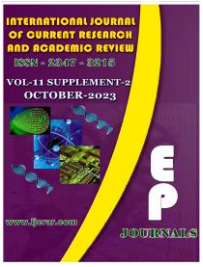

Application of Statistics in Corporate Sectors

Almost every small and large business employs a dedicated statistical research division that aims to predict and analyse the company's current and predicted growth. Research issues related to products, customer service, employees and sales. Business success relies on identifying what is important and what is vague.

Application of Statistics in Weather Forecasting

Have you ever looked at a weather forecast? Do you know how the government, as well as several international and national news channels, forecast the weather? Weather forecasting relies heavily on statistics. Weather forecasting on computers is based on a set of statistical functions. All of these statistics are used to compare the current weather to previously recorded seasons and conditions.

Conclusion

So far, that statistics can be used or applied in a variety of domains, including business, industry, agricultural, government, private, computer science, sciences, health sciences, and other disciplines. You can also apply for the Civil Services, Indian Statistical Services, and Indian Economic Services exams after completing your statistics studies. After completing the degree, students can pursue careers in finance, analytics, software development, actuarial science, and a variety of other fields.

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EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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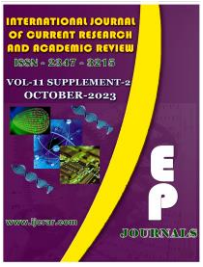
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Full Length Article **IJCRAR/FL/82**

Overview of Augmented Reality and Five Potential Paths for Implementing AR in Education

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Abstract

Augmented Reality (AR) represents an emerging experiential paradigm where the real world is enriched through computer-generated content intricately linked to specific locations or activities. In recent years, AR applications have become portable and readily accessible on mobile devices. AR is increasingly finding its place in various forms of audio-visual media, such as news, entertainment, and sports, and is starting to make significant inroads into other aspects of our lives like e-commerce, travel, and marketing in tangible and captivating ways. By enabling ubiquitous learning, AR offers learners immediate access to location-specific information from a multitude of sources (2009). Both the 2010 and 2011 Horizon Reports predict that AR will soon become widely adopted on college campuses in the United States. To prepare for this shift, this paper provides an overview of AR, delves into recent AR advancements, explores the societal impact of AR, and assesses the implications of AR for the realm of learning and education.

Keywords: Transformative technology, Futuristic concept, Tangible technology, Hardware advancement, Experimental paradigm.

Introduction

Uplifted verisimilitude (UV) is an emerging pattern of involvement wherein the actual globe (AW) is enriched by computer-formed contents that are linked to particular spots and/or undertakings. Put plainly, UV permits numeric material to be fluently superimposed and blended

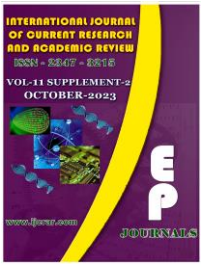
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



into our conceptions of the concrete globe. In accumulation to the 2D and 3D items that numerous might predict, numeric reserves like acoustic and visual files, textual data, and even sensory or touch data can be merged into users' views of the tangible globe. Jointly, these enhancements can help and elevate people's wisdom and appreciation of what is happening in their milieu. Rather than appearing unnatural, the numeric notations ingrained in UV enable users to sense the concrete globe, alongside 'added' facts, as a singular, continuous environment.

While speculative fiction introduced the idea of AR to our shared awareness quite some time ago, until extremely recently, some could have classified it as an aspect of our far-off tomorrow. Nonetheless, presently, we find ourselves at the forefront of a technological surge. AR is teetering on the brink of evolving into a prevalent phrase, and conceivably, for numerous individuals, an indivisible element of day-to-day existence.

Even though the mechanisms enabling this have existed for quite some duration, only recently has AR become "feasible" on everyday level tools. The use of Flash-oriented AR identification algorithms, combined with the expanding acceptance of portable platforms (e.g., iOS and Android), has ultimately unveiled the gateway, allowing AR to be within reach for the general population. Already AR is emerging in our aural and visual media (e.g., news, entertainment, sports) and is kicking off to infiltrate different facets of our daily existence (e.g., e-commerce, travel, marketing) in material and exhilarating methods.

While we can readily conceptualize applications for AR in a multitude of fields, perhaps the most thrilling ones are the prospects inherent in education. With AR, the dreams of educators for universal learning may come to fruition. Like never before, through AR, students will gain prompt entry to a comprehensive range of site-specific information, gathered and presented by an assortment of sources.

Annually, the New Media Consortium's (NMC's) Pioneering Technology Initiative formulates a Horizon Report that strives to spot and comprehend rising technologies which hold the assurance of making a substantial impact across multiple sectors worldwide, and which demonstrate the potential to favorably affect learning, imaginative investigation, and education (NMC, 2011). The 2010 and 2011 Horizon Reports (NMC) both anticipated that AR would see widespread adoption

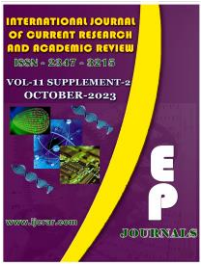
EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



across American college campuses within the subsequent 2 to 3 years. Keeping that in consideration, this paper furnishes an outline of AR, scrutinizes contemporary AR advancements, investigates the influence of AR on society, and assesses the ramifications of AR for learning and education.

Enhanced Reality Innovation

Now, numerous cell AR apps are place oriented. To employ these AR apps on a cell gadget or a cell, the device must have numerous vital instruments: (a) Global Positioning System tech; (b) an inclinometer, and (c) a digital orientation (magnetometer). By making use of cell AR apps, individuals can observe the realm via cell cameras to notice numeric material mingled with the tangible milieu.

Past and Contemporary Advancements in Enhanced Reality

The evolution of Enhanced Reality (ER) has seen significant milestones in the past and continues to make remarkable strides in contemporary times. In its early stages, ER was primarily conceptual and experimental, with initial applications limited to specialized industrial and military uses.

However, recent years have witnessed a proliferation of ER technologies and applications, driven by advances in computing power, miniaturization of hardware, and the widespread adoption of mobile devices. Today, ER is integrated into various sectors, including entertainment, gaming, education, healthcare, and manufacturing. It has transformed how we interact with digital information by seamlessly merging computer-generated content with our physical surroundings, offering immersive experiences and practical utility in an ever-expanding range of contexts. As ER technologies continue to advance, we can expect even more exciting developments that will further reshape our interactions with the world around us.

Modified Reality (MR) has encountered diverse uses throughout various domains, enhancing user interactions and delivering pragmatic solutions. Some prominent instances of MR application encompass:

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Gaming

MR has transformed play with well-liked apps like Pokémon GO, blending simulated creatures and features with actual-world settings. Participants can engage with numeric content in real-world locales, constituting immersive play encounters.

Learning

MR offers interactive and captivating teaching occurrences. Teaching apps can overlay data, animations, or 3D replicas on textbooks or actual-world objects, producing more interactive and pleasurable schooling.

Healthcare

Doctors utilize MR for preoperative plotting and throughout operations to envision patient information and physical structures in real-time. Medical learning schemes also apply MR simulations for skill improvement.

Construction and Blueprint

Planners and developers apply MR to picture structural models in actual atmospheres. Customers can undergo simulated walk-throughs of proposed structures prior to construction outset.

Orientation

MR-energized direction apps improve live instructions by superimposing path data onto the real-time view, simplifying user route discovery.

Trade and Internet Trade

MR enables clients to virtually test garments, accessories, or cosmetics before web procurement. It similarly extends interactive commodity lists and in-store direction help.

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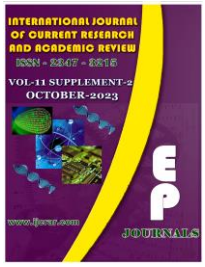
International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Excursions

Tourist apps employ MR to supply info regarding landmarks, historical places, and lures when users target their mobiles at distinct locales or items.

Upkeep and Mending

On-site workforce can deploy MR to enter mend manuals and visualize directions overlaid onto the equipment they are maintaining, amplifying productivity and precision.

Amusement

MR is employed in real-life functions, gigs, and sports transmissions to exhibit real-time figures, artwork, and particular impacts to elevate the observer's involvement.

Promotion and Publicity

Brands utilize MR plans to interact with clients. Reading merchandise tags or notices with a mobile can unlock interactive data or promotions.

Instruction and Role Play

MR is applied for military teaching, aviation mock-ups, and high-risk profession instruction to yield realistic conditions without real-world jeopardy.

Museum and Art Gallery

MR elevates the guest involvement by delivering additional data, 3D restructurings, or interactive displays when watching art or chronological valuables.

These are merely a few paradigms, and the implementation of MR persists in extending as machinery progresses. MR's capability to merge numeric and actual domains furnishes massive capacity for innovation crosswise various domains.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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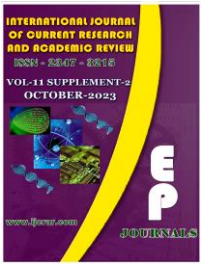
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Tools for AR Applications

Tools for Augmented Reality (AR) applications encompass both hardware and software elements, serving as essential components for enabling AR functionality. Everyday devices like mobile phones and tablets, equipped with cameras, GPS, accelerometers, gyroscopes, and high-resolution screens, serve as the foundational platforms for AR experiences. These devices seamlessly merge digital content with the real world, creating immersive interactions. Specialized AR hardware, such as smart glasses and headsets like Microsoft HoloLens and Magic Leap, enhance immersion by incorporating depth sensors and eye-tracking technology, improving user engagement and tracking accuracy.

Critical sensors like GPS for location tracking, accelerometers for motion detection, gyroscopes for orientation monitoring, and magnetometers for direction sensing provide real-time precision in tracking device position and orientation. Depth-sensing technologies, including Kinect cameras and LiDAR sensors, enable AR apps to comprehend and interact with the physical environment in three dimensions.

Regarding software tools, AR development relies on a comprehensive toolkit. AR Development Kits, such as ARKit for iOS and ARCore for Android, offer tailored APIs and libraries for crafting AR applications on mobile devices. These kits handle complex tasks such as motion tracking, environmental awareness, and the seamless integration of virtual elements into the real world. Game engines like Unity3D and Unreal Engine are popular choices for developing cross-platform AR apps, providing robust toolsets and plugins compatible with various AR hardware. Software for 3D modeling and animation, such as Blender, Maya, and 3ds Max, aids in creating 3D models, animations, and digital assets seamlessly integrated into AR experiences.

Crucially, computer vision libraries like OpenCV and TensorFlow play pivotal roles in object recognition, tracking, and real-time scene comprehension for AR applications. Some AR apps leverage cloud-based services to process and render intricate AR content, offloading computational demands to remote servers for enhanced dynamism. Programming languages like C#, Java, or C++ are employed by developers to tailor AR applications to their chosen platforms and tools. Additionally, the Augmented Reality Markup Language (ARML) standardizes the

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International Journal of Current Research and Academic Review

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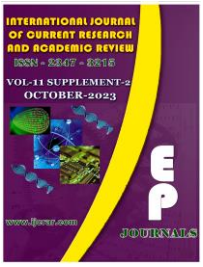
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



description of AR object positioning and behavior within physical spaces, promoting compatibility among AR applications and devices. Collectively, this diverse array of hardware and software tools empowers developers to create AR applications that elevate user experiences across numerous domains.

Prospects for Augmented Reality and Education in the Coming Years

The view for Augmented Reality (AR) in education holds remarkable potential, with the ability to transform the learning encounter. In the approaching years, we can expect AR to progressively merge with classrooms and educational establishments. A standout advantage of AR in education lies in its potential to render learning more captivating and interactive. AR can breathe life into abstract ideas by superimposing digital data, 3D models, and simulations onto the tangible realm. This hands-on, immersive strategy can significantly boost students' grasp of intricate subjects, proving especially beneficial in scientific, mathematical, and engineering domains.

Moreover, AR has the potential to cultivate individualized learning experiences. With AR apps and devices, students can explore educational material at their personal pace and skill level. For example, adaptable AR applications can adapt task complexity based on individual progression, guaranteeing that each student obtains customized assistance. Additionally, AR has the potential to eliminate geographical barriers by enabling remote and collaborative learning occurrences. Learners from diverse corners of the globe can connect and study together in virtual classrooms, broadening their horizons and cultural awareness. As AR technology progresses and becomes more accessible, we can envision an educational environment that is not just more interactive and engaging but also more comprehensive and adaptable to individualized learning necessities.

Furthermore, AR is expected to discover uses beyond conventional classrooms. In a world where lifelong learning is becoming increasingly vital in a fast-evolving job market, AR can facilitate on-the-job training, professional growth, and skill enhancement. Industries like healthcare, aviation, and manufacturing can employ AR to deliver practical training and assistance to employees, thus diminishing the learning curve and enhancing safety. Altogether, the future of AR in education presents a shift toward more immersive, interactive, and accessible learning experiences that can benefit learners of every age and background.

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International Journal of Current Research and Academic Review

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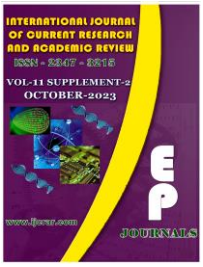
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



According to Dede (2008), all these skills can be effectively learned by users participating in interactive and immersive AR and VR educational activities. For one, through learning to adopt virtual personas, while participating in virtual tasks, problems, and games, learners can disassociate themselves from negative self-conceptions and blocks that might otherwise hinder their learning (Steinkuehler, & Williams, 2006). Dede (2008) points out that immersive experiences, especially those in which users act out shifts in identity, can help learners achieve greater awareness of multiple perspectives

Beyond designed educational AR Games, such as "Alien Landing" (Dede, 2008), researchers are examining how to use game mechanics to build user interests in factual data, such as real-world socio-economic regional statistics (Diakopoulos, Kivran-Swaine, & Naaman, 2011).

However, while many of the educational potentials of AR may seem exciting, some of the changes that will soon come to pass may challenge current educators' entire perception of academic learning and culture. For example, with the development of AR holographic projection technologies, interfaced with portable video conferencing technologies, learners and educators will soon gain the opportunity to conference face-to-face, through a portable 3D AR interface (Billinghurst, Cheok, Prince, & Kato, 2002; Billinghurst & Kato, 2002). With functional 3D AR conferencing, suddenly, as never before, learners and educators, will be able to communicate effortlessly over a distance, maintaining the use of the non-verbal information that is so integral to human communication.

However, current, non-AR methods of online interaction, such as email, text, audio, and visual chat, shared documents and whiteboards, and other conventional internet communication protocols, all suffer to varying degrees from barriers and limitations inherent in each interface (Galusha, 1997). For this reason, both educators and learners can often approach hybrid and online learning environments with, if not apprehension, then a decided lack of optimistic enthusiasm.

However, with shared AR conferencing, delivered in full 3D at 30 frames per second (or faster), combined with shared AR workspaces, existing barriers to long-distance communication will

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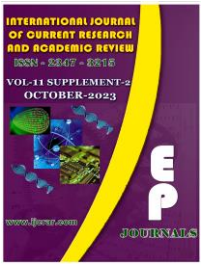

dramatically decrease, and perhaps fade away entirely (Billinghurst, Cheok, Prince, & Kato, 2002; Billinghurst & Kato, 2002).

In addition, through the continuing research in AR technologies, it is possible that AR will eventually lead to a complete and immersive VR (virtual reality), allowing humans to surround themselves with a convincing virtual environment in which they can interact with other humans, with computers, and with programs. The first steps towards this 3D internet can be seen in services like Second Life, by Linden Lab, which already has between 1 and 6 million users, depending on who's counting (Fulton, 2007). Second Life is already being utilized by universities to host virtual classrooms. With continuing advances in AR, these classrooms can be even more immersive, and 'field trips' can become spectacular and truly inspiring for students. Also, with improved AR and VR technology, virtual scenario training, for doctors, lawyers, political speakers, emergency response workers, soldiers, pilots, and in fact people of any profession or practice, including teachers, could become an incredibly valuable tool.

For the present, while movements towards increased and improved distance education, both through real-world, AR, and VR interfaces are underway and seemingly speeding along, the incredible rapidity of technological change and development is a wave that educators have grown used to riding. While the world is undoubtedly changing, we will grow and adapt along with it. In fact, if we have our way, we will be the ones on the forefront, pushing forward with new innovations and improvements for teaching and learning. On a calmer note, most current educators will find that, while it is possible for them, as individuals, to create AR content using the tools mentioned earlier in this paper, truly user-friendly AR creation tools may still be just over the horizon. With that in mind, our task remains to keep examining what is available, and creatively utilizing it, to keep driving change forward.

Conclusion

Augmented Reality (AR) represents a transformative force across various domains, from gaming and healthcare to education and beyond. AR has evolved from a futuristic concept to a tangible and increasingly accessible technology, thanks to the convergence of hardware advancements and

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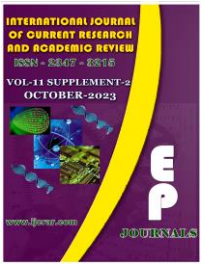

sophisticated software tools. It offers the potential to enhance our interactions with the physical world, delivering immersive and engaging experiences.

In the realm of education, AR holds the promise of revolutionizing the way we learn and teach. It can make learning more interactive, personalized, and inclusive. By overlaying digital content onto the real world, AR bridges the gap between abstract concepts and concrete understanding, particularly in complex subjects like science and mathematics. Moreover, AR enables students to explore educational content at their own pace and collaborate with peers worldwide, breaking down geographical barriers.

Looking ahead, the future of AR in education and other fields appears bright. As technology continues to advance, AR is poised to become an integral part of our daily lives, offering new dimensions of learning, work, and entertainment. It is a testament to human innovation and our ability to harness technology to enhance the way we perceive and interact with the world around us.

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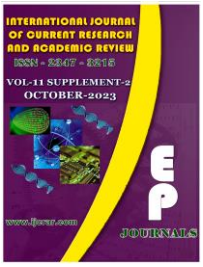
International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Full Length Article **IJCRAR/FL/83**

Applied Statistics

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Abstract

Statistics is an old scientific discipline, but its application has never been more topical.Statistics is a branch of mathematics that deals with the collection, analysis, interpretation andpresentation of data. Increased computing power had a huge impact on the popularisation of the practice of statistical science. With new technologies such as the internet of things, we start tocollect data from various sources like web server logs, online transaction records, tweetstreams, social media, data from all kinds of sensors. With increased access to big data, there isa need for professionals with applied statistics knowledge who can visualize and analyze data, make sense of it, and use it to solve real complex problems. Applied statistics is the root of dataanalysis, and the practice of applied statistics involves analyzing data to help define anddetermine organizational needs. Today we can find applied statistics in various fields such asmedicine, information technology, engineering, finance, marketing, accounting, business, etc.The goal of this paper is to clarify the applied statistics, its principles and to present itsapplication in various fields.

Keywords: Applied Statistics, operational activities, analytical methods, presentation and visualization.

Introduction

The term Applied Statistics refers to the use of statistical theory to conduct operational activities in a variety of fields in real life situations. Today, the applications of statistics are an indispensable part of any and every activity.

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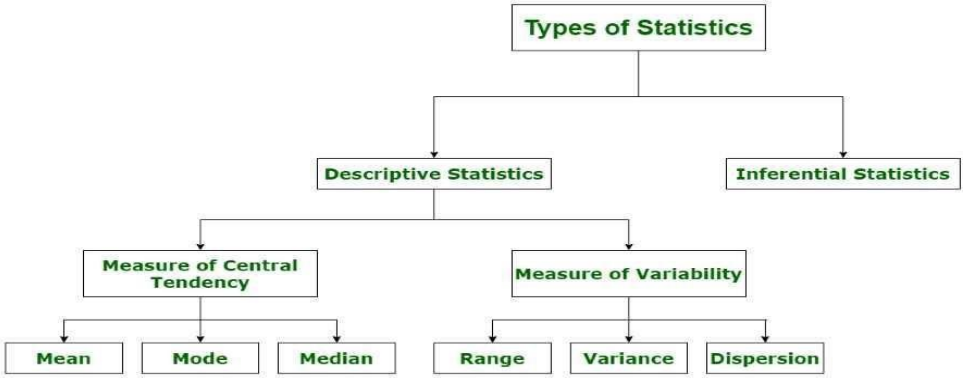
Types of Statistics

Fig.1



Principles of Applied Statistics

It is difficult to give a simple statement of the main principles of applied statistics because of its variety of applications. Statistical analysis of data is not a highly specific particular field of study.

- Formulating and explaining specific research questions relevant to the subject.
- Creating solutions that provide a secure answer and open up new possibilities.
- Development of efficient and reliable measurement procedures.
- Development of analytical methods with suitable software following the primary research problem.
- Effective presentation and visualization of conclusions.
- Structured analysis to facilitate their interpretation in terms of subjects and their relationship to the knowledge base of the field.

Career Opportunities

- Scientific research and development services
- Pharmaceutical and medicine manufacturing

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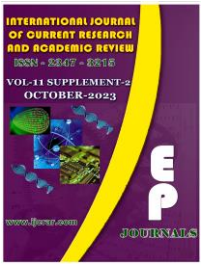

- Colleges, universities and professional schools
- Insurance carriers
- Management, scientific and technical consulting services
- Hospitals and medical centers
- Software publishers
- Banks and credit unions
- Government agencies
- Accounting, tax preparation, bookkeeping and payroll services

Evolution of Applied Statistics

The technologies powering many of the products we buy, shows we watch, and devices we use today were developed and perfected through the efforts of mathematicians, demographers and statisticians – long before tech companies came on the scene.

Conclusion

Statistical methods and technological instruments such as spreadsheets to solve real-world challenges using data in Applied Statistics. It incorporates the science of gathering, arranging, and analyzing numerical data, focusing on mathematical inference and data interpretation.

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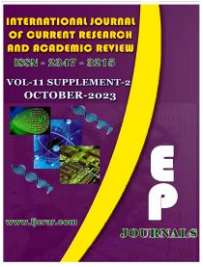

Full Length Article **IJCRAR/FL/84**

Abstract Algebra

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Abstract

Abstract algebra is the set of advanced topics of algebra that deal with abstract algebraic structures rather than the usual number systems. The most important of these structures are groups, rings, and fields. Important branches of abstract algebra are commutative algebra, representation theory, and homological algebra. Linear algebra, elementary number theory, and discrete mathematics are sometimes considered branches of abstract algebra. Ash (1998) includes the following areas in his definition of abstract algebra: logic and foundations, counting, elementary number theory, informal set theory, linear algebra, and the theory of linear operators. The main purpose of abstract algebra is analyzing a set endowed with one or more operations with special characteristics or properties to learn about the relationships between those properties of the operations in a precise way, as well as the consequences and possible results of their associations. This is a term from abstract algebra used to name a type of binary operation where two elements of given sets are assigned to another element, giving rise to distinct algebraic structures. The law of composition can be internal or external, depending on whether the elements in the application are part of the same set or of different sets, respectively.

Keywords: Concrete problems, core, groups, rings, fields, number theory, geometry.

Introduction

Before the nineteenth century, algebra was defined as the study of polynomials. Abstract algebra came into existence during the nineteenth century as more complex problems and solution methods developed. Concrete problems and examples came from number theory, geometry,

International Journal of Current Research and Academic Review
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Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

analysis, and the solutions of algebraic equations. Most theories that are now recognized as parts of abstract algebra started as collections of disparate facts from various branches of mathematics, acquired a common theme that served as a core around which various results were grouped, and finally became unified on a basis of a common set of concepts. This unification occurred in the early decades of the 20th century and resulted in the formal axiomatic definitions of various algebraic structures such as groups, rings, and fields.

What is Algebra?

Algebra is one of the oldest branches in the history of mathematics that deals with number theory, geometry, and analysis. The definition of algebra sometimes states that the study of the mathematical symbols and the rules involves manipulating these mathematical symbols.

Algebra includes almost everything right from solving elementary equations to the study of abstractions. Algebra equations are included in many chapters of math, which students will learn in their academics. Also, there are several formulas and identities present in algebra. Algebra helps solve the mathematical equations and allows to derive unknown quantities, like the bank interest, proportions, percentage.

The algebraic formulas are used in our daily lives to find the distance and volume of containers and figure out the sales prices as and when needed. Algebra is constructive in stating a mathematical equation and relationship by using letters or other symbols representing the entities. The unknown quantities in the equation can be solved through algebra.

Abstract Algebraic Structures

An algebraic structure is any set upon which "arithmetic-like" operations have been defined. The importance of such structures in abstract mathematics cannot be overstated. By recognized a given set S as an instance of a well-known algebraic structure, every result that is known about that abstract algebraic structure is then automatically also known to hold for S. This utility is, in large part, the main motivation behind abstraction. In abstract algebra, “structure” means a set or group with one or more algebraic operations. These structures are classified according to the

International Journal of Current Research and Academic Review
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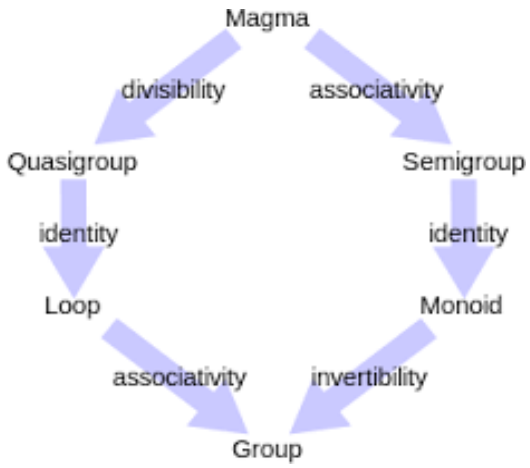
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

number of operations that may exist in them, as well as by their characteristics, the number of elements or subsets, and the relationship that exists among the elements of the main set, regardless of their nature.

Branches of abstract algebra

- Commutative Algebra
- Representation Theory
- Homological Algebra
- Linear Algebra
- Elementary Number Theory
- Discrete Mathematics

Fig.1



Levels of Abstraction in Abstract Algebra

It is possible to abstract away practically all of the properties found in the "usual" number systems, the tradeoff being that the resulting object--known as a magma (which consists of a set and a binary operation, that need not satisfy any properties other than closure)--is simply too

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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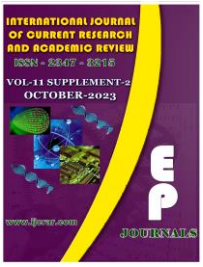

general to be interesting. On the other extreme, it is possible to abstract out practically no properties, which allows for many results to be found, but the resulting object is too specific to solve more general problems. Most of abstract algebra is dedicated to objects that have a reasonable balance between generality and structure, most notably groups and rings in which most of the basic properties of arithmetic are maintained, but their specifics are left free. Still, some higher levels of abstraction are occasionally useful; quasi groups, for instance, are related to Latin squares, are often used in computer science and are simple examples of categories.

Uses of Abstract Algebra

The main purpose of abstract algebra is analyzing a set endowed with one or more operations with special characteristics or properties to learn about the relationships between those properties of the operations in a precise way, as well as the consequences and possible results of their associations. Because of its generality, abstract algebra is used in many fields of mathematics and science.

- For instance, algebraic topology uses algebraic objects to study topologies.
- The Poincare conjecture, proved in 2003, asserts that the fundamental group of a manifold, which encodes information about connectedness, can be used to determine whether a manifold is a sphere or not.
- Algebraic number theory studies various number rings that generalize the set of integers.
- Using tools of algebraic number theory, Andrew Wiles proved Fermat's Last Theorem.
- In physics, groups are used to represent symmetry operations, and the usage of group theory could simplify differential equations.
- In gauge theory, the requirement of local symmetry can be used to deduce the equations describing a system. The groups that describe those symmetries are Lie groups, and the study of Lie groups and Lie algebras reveals much about the physical system.

Real Life Applications of Abstract Algebra

1. Linear algebra is used to check the distribution of microwave energy in a microwave oven.
2. Used to create ranking algorithm in search engines such as Google, Yahoo, etc.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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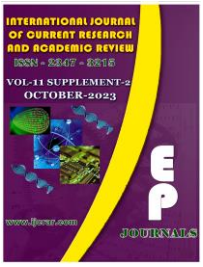
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



3. Used to recover the codes that have been tampered with during processing or transmission.
4. Used for space studies.
5. Used to check the energy levels of atoms.

Conclusion

While elementary and abstract algebra both respond to the same general approaches to algebra, there are differences between them; for example, while elementary algebra is based on solving simple algebraic equations, abstract algebra looks at algebraic systems and structures or groups with different operations. Elementary algebra studies real numbers and complex numbers, while abstract algebra expresses mathematical structures that cannot necessarily be expressed with numerical values.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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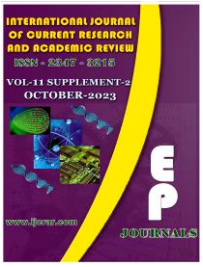

Full Length Article **IJCRAR/FL/85**

Mobile and Wireless Networks: Services, Evolution and Issues

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Abstract

Wireless technologies in the last decade or so have attracted unprecedented attention from wireless service providers, developers, vendors, and users. The breathtaking evolution of wireless technologies, services and business applications has resulted in a wide-scale deployment and usage of wireless and mobile networks. The paper discusses mobile and wireless networks in terms of services, technical evolution, and related issues. Industries such as transportation and logistics, financial services, health services, and many others should be able to improve their performance by implementing wireless mobile technologies.

Keywords: Mobile wireless networks, mobile services, wireless LANs, wireless standards future technologies

Introduction

The wireless network technologies (3G and forthcoming 4G wireless services) have witnessed exciting innovations and will continue to represent a rapidly growing sector in the near future. These evolving technologies have increased an organisation's ability to reach customers regardless of their locations. 3G mobile networks – that are expanding on the existing wireless network technology – offer broadband transmission with speeds of up to 2 mega bits per second (Mbps) in some areas of the world, but the international 3G networks standard known as IMT-2000 defines no less than five incompatible 3G wireless standards. Three of these five standards

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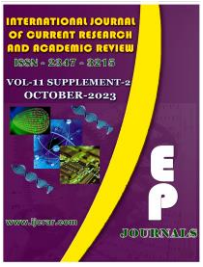

are currently in different stagesof realisation. The existence of these multiple standards is not likely to solve the well- known problem of interoperability of wireless networks. 3G wireless access systems provide basic data services along with voice and messaging capabilities. However, the telecommunications vendors and service providers are already researching and developing a next-generation, true broadband wireless cellular system, known as the Fourth Generation or simply the 4G. Wireless service providers and application vendors will strive to meet the expectations as new technology evolves to form tomorrow's wireless networks. What lies ahead of the next generation wireless technologies (such as 3G, 4G wireless networks, and broadband fixed wireless communications) generates great opportunities for wireless services and applications, namely m-commerce, m-business, ubiquitous business, and pervasive healthcare.

Mobile and Wireless Services

Mobile commerce is an emerging area involving business activities conducted over mobile and wireless networks using handheld devices (Varshney and Vetter, 2002). It not only includes mobile versions of existing e-commerce applications, but also new and innovative applications that are largely becoming possible due to mobile and wireless networks, eg., location-based services and services requiring user attention very frequently including mobile multi-party interactive games. Mobile commerce has attracted significant attention among users, service providers, vendors, content developers, businesses, and researchers (Varshney and Vetter, 2002) due to its potential impact. It brings many unique characteristics that are significantly different from e- commerce and wireless communications, such as location and context awareness, user-centric and personalisation, and transaction support. It will have a larger role as thirdparty providers because wireless carriers may not able to develop and manage sophisticated and personalised contents for a large number of users. Mobile commerce has the potential to transform the ways business is conducted from many different angles. Several B2B (Business to Business) m-commerce applications can improve the efficiencyof business processes, improve the quality of services to users and other businesses, and create many new opportunities and markets. There are markets of several billion dollars a year in Japan, where DoCoMo supports mobile commerce payments by scanning cell phones and other hand-held devices, e.g., several European countries with high levels of wireless adoption where m-commerce is generating

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

billions of dollars in revenue from mobile tickets, mobile parking, mobile coupons, mobile advertising, and mobile shopping.

Evolution of Wireless Networks

The total number of cellular, Personal Communications System (PCS), and other wireless subscribers is expected to reach two billion by the end of 2006, if not earlier with more than 1.7 billion wireless subscribers. The current users are served by many different standards that exist in the world today. These include first and second generation (1G and 2G) networks based on one or more versions of wireless communication protocols including the Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), and 3G via cdma2000 or Wide-band Code Division Multiple Access (WCDMA). It should be noted that 3G specifications offer the flexibility needed by both the existing operators to evolve their first and second-generation networks towards 3G services and the satellite or terrestrial providers in designing new 3G systems. The radio specifications allow five different choices, carefully designed to help existing first- and second-generation wireless systems to interwork with or evolve into 3G systems. However, the worldwide migration to 3G has not been as fast as hyped due to the operators' perception of limited market needs, lack of incentives to carriers and operators, heavy capital investment made in the existing first and second generation wireless systems, and a monopoly of wireless carriers in many countries

Wi-Fi: a threat or an opportunity for wireless carriers.

One of several surprising developments in the domain of wireless communications is the rapid acceptance of the IEEE family of 802.11 standards, also called Wi-Fi (short for wireless fidelity), wireless LAN, or WLAN. Wi-Fi was designed as an inexpensive alternative for the hard-wired Ethernet because it does not cost as much to set it up since buildings do not need to be wired or rewired. Its high-bandwidth connections to the internet cost only a quarter as much as the wiring most companies use today.

Wi-Fi has quickly gained popularity among small companies and hobbyists who extended the coverage by setting up the Wi-Fi access points or hotspots in urban neighbourhoods. Rapid acceptance has also been facilitated by the proliferation of inexpensive radio cards, and most new

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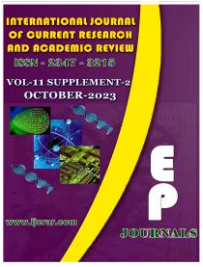

laptops and PDAs having built-in radio cards. It consequently gained quick support of industry giants such as Intel, Cisco, Microsoft, IBM, AT&T, Verizon Communications, T-Mobile USA, SBC Communications, andmany others, not to mention a lot of smaller players and startups.

Standards

Wi-Fi (defined as a family of standards developed by the IEEE) is a radio communication technology with a high bandwidth of up to 54 Mbps, but a short range of about 100 metres. The first standard, 802.11, published in 1997, provided several modes of operation and speeds up to 2 Mbps. Work soon started on improving performance, resulting in two new but incompatible versions of the standard: 802.11b and 802.11a. The two versions use different coding schemes and operate in different frequency ranges.

National Wi-Fi networks:

Startups are trying to tie the hodgepodge of Wi-Fi networks into a usable national network by recognising the promise of high-speed wireless communication, but everybody wants to be an aggregator, because installation of base stations involves substantial capital investment and few companies are actually adding the hotspots. Even large corporations, not all of them from the telecommunication sector, do not want to miss the opportunity and are exploring and testing the deployment of Wi-Fi networks. Can they build a national service with a wide range of hotspots? Some are suggesting that such a network would enable users to reach the nearest hotspot, at least in urban areas, in at most five minutes. Others believe that such networks can bridge the last mile and supply broadband connection to homes.

Small and big business models:

Most public Wi-Fi models have suffered both high deployment costs and disappointing customer user rates. The Kerton Group observed a clash between big business economics and small business services. It is true that one can set up Wi-Fi at home for $100 in equipment and $40 a month for a lease of a DSL line, but it is also true that a commercial hotspot provider, Mobilstar, went bankrupt (Kerton, 2003). There appears to be two business models: a small business model

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

which makes sense, and a big business model which has yet to be proven.

New threat: metropolitan area networks:

The 802.16 standard is a Wireless Metropolitan Area Network (WMAN) technology that will provide broadband wireless connectivity to fixed, portable, and nomadic devices. It is officially known as the IEEE Wireless MAN standard and can be used to connect 802.11 hotspots to the internet, provide campus connectivity, and provide a wireless alternative to cable and DSL connections for the last mile broadband access. It provides up to 50-kilometre service area range, allows users to get broadband connectivity without needing direct line of sight with the base station, and provides total data rates of up to 280 Mbps per base station. A single base station provides enough bandwidth to simultaneously support hundreds of businesses with speeds equivalent to a T1 line and thousands of homes with speeds like DSL lines (Anonymous, 2003).

The Future and Conclusion

The future of wireless and mobile networks will involve increasingly sophisticated services that will be context-aware, personalised and user-programmable. These services will offer significant user-empowerment by utilising user preferences and history. Many new applications such as pervasive and vehicular commerce will become reality as the number of vehicles with significant computing and communications power increases substantially. The mobile devices will become increasingly intelligent, personalised and owner-centric devices and carry personal, health, and financial information. It is possible that global roaming and internetworking issues could be resolved in the future 4G networks, which are being designed to provide much higher bit rates. Added complexity could exist in the networks or in the devices, depending on thearchitectures used. The bandwidth limitations for many existing and emerging applications will become a thing of the past due to increasingly higher bit rate wireless networks, e.g., 3.5G and 4G become reality along with 300+ Mbps high-speed wireless LANs in the next few years. Many other technical advances such as Multiple Inputs Multiple Outputs (MIMO), dynamic spectrum management, and Ultra-Wide-Band (UWB) will offer higher bit rates. The use of IP-backbone for internet compatibility and to support different levels of mobility, from local to global will also

EXCELLENT PUBLISHERS

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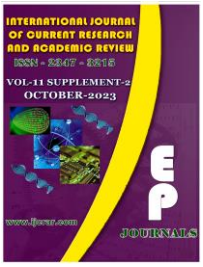

become common. The deployment of short-rangesensor and ad hoc networks will further extend the reach of wireless networks.

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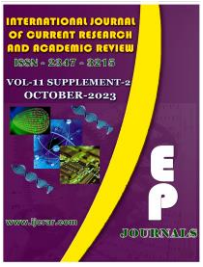

Full Length Article **IJCRAR/FL/86**

A Review Paper on Human Computer Interaction

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Abstract

The idea of human computer interaction comes because of the advancement in the development of computer technology. HCI (human-computer interaction) covers both technical and human behavioral concerns. The main purpose of practical research in human-computer interaction is to disclose unknown perception about behavior of humans and its relationship to technology. Resilience is just a set of routines that allow us to recover from obstacles. The term resilience has been applied to almost everything from the economy, real estate, events, sports, business, psychology, educational field and more. Resilience is basically made up of a number of various abilities and skills for the purpose of building strong relationships, self-efficacy, optimism, self-awareness, creating meaning from other experiences that are some of the basic ingredients. In this through process people should use this for the increased quality of an organization's resilience. For the purpose of building up knowledge of resources which is available to the people for the purpose of confronting existing problems, these all things will be done by the Resilience.

Keywords: Artifacts, Emotional intelligence, Fidelity Prototyping, Goals of HCI, Human computer interaction, Human Factors, Interactivity, Information Systems, Resilience, Resilience Strategies, Technology, Younger participants.

Introduction

Nowadays the growth of computing is rapidly increasing. And also use of computers for the human is essential in various tasks. HCI (human-computer interaction) is the study of interaction of people with computer.And to what range computers are developed for successful interaction

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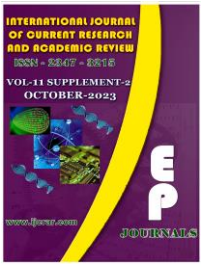

with human beings or and also what are the things which are not developed for successful interaction with human beings. HCI includes three parts as its name says: the human (the user), interaction machine itself (the computer) and the methods (ways) they work together. So this is all about the relationship between a computer and a human, and their common understandings. And doing work by humans is done easily by using the software (created using technology). After that people/humans would love to use that software for the purpose of doing work in an efficient way. And people also would be able to use that software.Human-computer interaction, in this basically studied how to interact with the computer/machines, what are the possible ways for interaction with the computer. And also find what other ways can be developed so that people can interact with computers successfully. In the growth of the field of human-computer interaction is not focusing on only how to improve the quality of interaction.

In other words, HCI (human-computer interaction) is a study of how humans perform various tasks using computers. And how they are using it in such a way where people are enjoying and doing effectively through the interaction from the computer. In the starting time only concerned with computers, but nowadays human- computer interaction has expanded in maximum areas to cover almost all forms of information technology design available in our surrounding.

In this various ways or methods where humans interact with the computer to do their work easily and efficiently. The abilities to respond and sense appropriately according to humans (the users) affective feedback and detect ,this is the initial step of an intelligent human-computer interaction (HCI). And this paper also focuses on the different types of design approaches of the human-computer interaction. Human-Computer Interaction covers various areas, which extract on the fields of cognitive science, and organizational and computer science, psychology, and social sciences in order to know about how the user's u1se and experience about how they use interactive technology.

There are two areas: information technology and organizational where current research in resilience has focused. The ability of an organization to survive in the threats, including the prevention or mitigation of unsafe, hazardous conditions .

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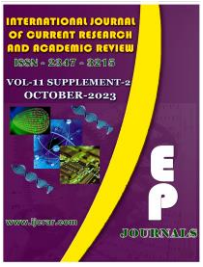

Humans

There are various human-computer interaction outcomes that are produced and used by the peoples and this product is developed by the humans and that's why this is also known as the product of the user's.

Computers

There are various components which are used to interact with computers, the computers are basically used to interact with the people (the users).There are various facilities which are provided by the computers and with the help of their various components the user can use the computer according to their own needs. Computers can perform various types of operations such as: storing and recalling the information, measuring, easily counting and can perform various types of mathematical operations, quick response of any query and data processing or calculation, in less amount of time repetitive work can be done by computers and performance of the computer will depends on the process of system and time required for that operation.

Interaction

Interaction is always a two way process. Here users can interact with the computers with the help of the components of the computer. User usually interacts with the computer to solve their query. Here it is clear that there are many differences between machines and humans. Human computer interaction ensures that they combined work together successfully. For the purpose of achieving a usable system, in that system, apply whatever you know about computers and humans, and also take suggestions from the various users about the design process.

User interface

User interface plays an important role in software project. In Human-computer Interaction in this interaction will be done in between the users and the computers, so in computer interaction user interface also plays a vital role because without an efficient user interface not a good communication will be established in between users and the computer system. User Interface

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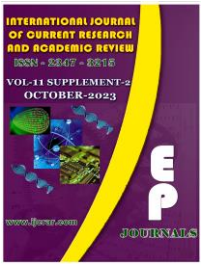

(UI) basically managed inputs (what user gives the inputs to the system) and also in displaying output.

Areas of HCI

There are various areas involved in the field of human computer interaction.

1.Computer science
2.Language
3.Sociology
4.Psychology
5.Design
6.Ethnography
7.Engineering
8.Semiotics
9.Ergonomics & human factor

In human computer interaction the facial expressions are considered as communicative signals or can be considered as being expressions of emotions & they can be associated with such types of emotions like:surprise,anger,happiness,fear,sadness,contempt.And there is also one other tool is emotional speech recognition which is used to detect the emotions.

Human Factor

Human Factors basically focus on the way people interact with various jobs; machines and the environment with the consideration have capabilities and limitations. A human factor comes under a cognitive or physicalproperty of an individual or social behavior which is particular to humans and impact of the human- environment equilibriums and as well as functioning of technological systems. Human factors also impact the way people communicate with computers and its applications. There is a problem because in the software development life cycle (SDLC) methods forsake to take human factors in consideration in the design stage of the user interface.

EXCELLENT PUBLISHERS

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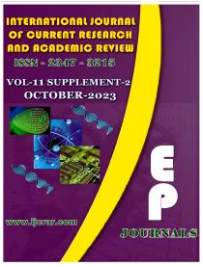

Strategies of Resilience

Resilience means the capacity to recover quickly from difficult situations or toughness. There are five pillars of resilience and from these pillars resilience is made up: awareness, mindfulness, positive relationships and purpose, self-care, by strengthening these pillars, we in turn, become more resilient. Now comes, In the discussion about organization resilience , in this basically the capacity will be rapidly modified and respond to the disruptions in the business and also management of the continuous business operations , for the purpose of enabling the growth and make own self a more trusted partner.In Resilience strategy the first step is to understand the needs of the organization in order to provide services and also find solutions to those problems when that problem comes at any point of time.

The goals of HCI

The main purpose of human computer interaction is to make systems usable, safe and secure, as well as systems must be functional. For making systems easy to use and easy to learn then here usability is concerned. In order to produce computer systems with good usability developers must attempt to

1.Recognize the components that gather details is that how the people are using the technology
2.Developing various tools & techniques that allow to build suitable systems

Conclusion

Nowadays research in Artificial Intelligence is going on and this is the most global research topic and in this also human computer interaction concept is used. Human computer interaction design makes important changes world-wide. To analyze behavior of humans at a deeper level so for the various components of human-computer interaction technology are used in this. Computers basically work according to the users instructions. And also got the results according to the instructions which are provided by the computers after some processes. In the coming days human-computer interaction will bring big changes in the world. It's basically easy to use always

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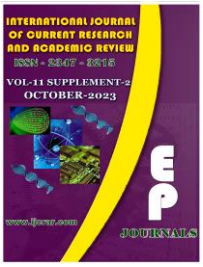

for humans and also the communication between the human and the computers totally depends on what instructions are fed to the system by the human.

The term resilience has been applied to everything from economy, to the real-state, sports, events,businesses,psychology and many more areas where resilience helps in difficult situations. The main of this study, with various other perspectives, was to gain information from us as much as possible.

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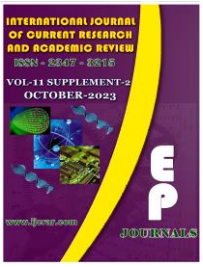

Full Length Article **IJCRAR/FL/87**

Facial Emotion Detection and Recognition

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Abstract

Facial emotional expression is a part of face recognition, it has always been an easy task for humans, but achieving the same with a computer algorithm is challenging. With the recent and continuous advancements in computer vision and machine learning, it is possible to detect emotions in images, videos, etc. A face expression recognition method based on the Deep Neural Networks especially the Convolutional Neural Network (CNN) and an image edge detection is proposed. The edge of each layer of the image is retrieved in the convolution process after the facial expression image is normalized. To maintain the texture picture's edge structure information, the retrieved edge information is placed on each feature image. In this research, several datasets are investigated and explored for training expression recognition models. The purpose of this paper is to make a study on face emotion detection and recognition via Machine learning algorithms and Deep learning. This research work will present deeper insights into Face emotion detection and Recognition. It will also highlight the variables that have an impact on its efficacy.

Keywords: Convolutional neural network, Machine learning, Deep learning, Computer vision, Emotion recognition.

Introduction

Human-computer interaction technology refers to a kind of technology that takes computer equipment as the medium, so as to realize the interaction between humans and computers. Face Recognition System (FRS) is a mechanism that allows cameras to automatically identify people. Because of the importance of correct and effective FRS, it drives the activeness of biometric

International Journal of Current Research and Academic Review
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research in the race to the digital world. In recent years, with the rapid development of pattern recognition and artificial intelligence, more and more research has been conducted in the field of human-computer interaction technology. Facial Emotion Recognition (FER) is a flourishing study topic in which many breakthroughs are being made in industries, such as automatic translation systems and machine-to-human contact. The classical (FER)consists of two main steps: feature extraction and emotion recognition.The challenge of facial emotion recognition is to automatically recognize facial emotion states with high accuracy. Therefore, it is challenging to find the similarity of the same emotional state between different people since they may express the same emotional state in various ways. As an example, the expression may vary in different situations such as the individual's mood, skin colour, age, and the environment surrounding.In the first, stage, which is a pre-processing stage, an image of a face is detected and facial components of the face will be detected from the region.In the second stage, an informative feature will be extracted from different parts of the face. In the last stage, a classifier needs to be trained before been use a classifier needs to be trained before being used to generate labels for the Emotions using the training data.

Background Information

a) Emotion Recognition:

Facial Recognition is a branch of computer science that deals with methods and strategies for detecting emotions in facial expressions. It is expected that expressions can be the next communication medium with computers the majority of this field's research focuses on recognizing human emotions from movies or auditory data.Emotions can be detected through facial expressions, verbal signals, and other indicators.

b)Facial Emotion Recognition:

Facial Emotion Recognition is a research area that tries to identify the emotion from the human facial expression. The surveys state that developments in emotion recognition make complex systems simpler.

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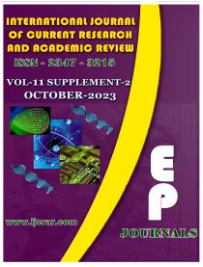

c)Deep Learning:

Deep Learning is a machine learning technique that models the data that are designed to do a particular task. Deep learning in neural networks has wide applications in the area of image recognition, classification, decision making,pattern recognition,etc…

Proposed Methodology

The proposed technique, the emotion database used for the study, and the Inception model are all explained in this section. This paper uses a Haar classifier for human detection. The Haar classifier is trained by Haar-like small features and also the Haar-like may be a commonly used texture descriptor, and its main features are linear, edge, canter, and diagonal. The Haar-like feature can reflect the grey level change of image, so it's very effective to explain the face because many features of external body parts have obvious contrast change characteristics. However, the calculation of eigenvalues is extremely time-consuming. so as to enhance the calculation speed, this paper uses the integral graph method to calculate the Haar-like values.

1. Face Detection:

Face detection could be a pre-processing phase to acknowledge the facial expressions of humans. a picture is segmented into two parts which have faces and other non-face regions.

2. Feature Extraction:

Feature extraction transforms pixel data from the face region into a higher-level representation of the face or its components shape, colour, texture, and spatial configuration.Feature extraction will reduce the dimension of the input space while keeping the important information. Feature extraction is vital in formulating a stronger emotion categorization because the extracted facial feature gives inputs to the classification module which finally categorizes different emotions. Feature extraction will be divided into two categories which are:(i) feature base and (ii) appearance base.

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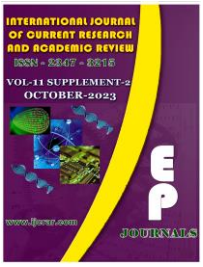

3. Expression Classification:

This stage is performed by a classifier. There are various classifications methods accustomed extract expressions.

Supervised Learning:

Supervised learning is a way of training a system using labelled data. The tagged data serves as a manager. The model is given both inputs and outputs to learn from. Following that, the model would forecast for a new data point. Classification and regression are the two types of supervised learning.

Dataset

To perform an experiment on FER, a regular database is required. The information will be perceived as primary or secondary. A primary dataset consumes an extended period to be completed with dataset collection. For study in FER, a spread of datasets available currently There are few datasets available for the emotion recognition problem; among those, Karolinska Directed Emotional Faces (KDEF)and Japanese Female facial features (JAFFE) datasets are well-known and regarded during this study. The dataset's images are divided into seven main emotion categories. The KDEF dataset (also refer as KDEF for simplicity, henceforth) was developed by Karolinska Institute, Sweden. Specifically, the aim of the dataset was to use for perception memory emotional attention, and backward masking experiment. The dataset contains 4900 photos of 70 people, each of whom is depicted in seven different emotional states.

Conclusion

We propose a face expression identification approach based on a CNN model that effectively extracts facial features in this research.Emotion expression is important in communication, hence improving the quality of interaction between humans. Furthermore, in the near future, the study of facial expression detection may provide improved feedback to society as well as the interaction between Human-Robot interfaces (HRI). Emotion detection mostly involves the geometric part of the face (e.g., eyes, eyebrows, and mouth).Furthermore, the concept of facial emotion recognition

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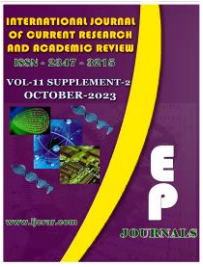

could be expanded to include emotion recognition from speech or body motions in order to address emerging industrial applications.

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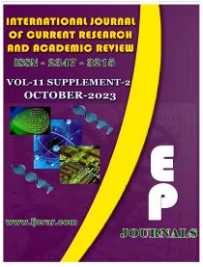

Full Length Article **IJCRAR/FL/88**

Recent Research Trends of Artificial Intelligence Applications in Power Electronics

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Abstract

The artificial intelligence (AI) is one of the most significant topics to obtain an optimal solution in various applications. Focusing on the AI applications to the power electronics, this paper presents their tendency and future trend systematically and exhaustively. In the process, IEEE Xplore is chosen for the paper investigation and the result is arranged chronologically. Furthermore, several considerable AI methods for the power electronics, such as the neural network, deep learning, genetic algorithm, particle swarm optimization, and multi-objective optimization, are explained. Several published papers with respect to AI applications to the power electronics in the renewable energy system are also introduced.

Keywords: Artificial Intelligence (AI), Convolutional Neural Network (CNN), Evolutionary Multi- Objective Optimization (EMO), IEEE Xplore, Neural Network (NN), Power Electronics, Renewable Energy System

Introduction

Recently, the research concerned with the Artificial Intelligence (AI) have been proceeded in the world. General Electric (GE), USA proposed Industrial Internet in 2012 [1]. The German government proposed Digital Germany 2015 (DG2015) in 2010 and Industry 4.0 in 2013. The Internet of Things (IoT) and AI have been recognized as key technologies to realize such a society. These technologies are tried implementing into the industry, service, etc. In the Industrial Internet, it is mentioned that these technologies are effective for the power generation, power

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conversion, and energy saving. It is noted that the AI application to the power electronics is not discussed.

The power electronics is the technical field related to the power conversion technology and motor drive technology using dc-ac inverters. Neither technology have remarkable AI applications. Due to this situation, Both AI engineers and power electronics engineers cannot understand how to apply AI to the power electronics.

The following six stages can be considered as the AI applications to the power electronics:

1) Device design
2) Circuit design
3) Control
4) System operation
5) Energy management
6) Engineering

AI Applications to Power Electronics

The AI applications to the power electronics are reclassified into following fields:

i) Circuit, machine, and system design
ii) Control
iii) System operation
iv) Detection or prediction of degradation, failure, and abnormalities

The discussion will be proceeded based on this classification in this paper.

Circuit, Machine, and System Design

The most basic AI applications to the power electronics are the design of circuit, machine, and system. They are divided into the following four optimizations: the first is the structure of circuit,

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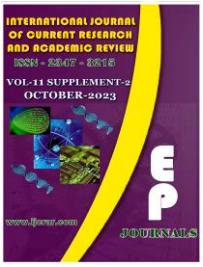

machine, and system, the second is the parameter of circuit, structure, and system, the third is the model of circuit, structure, and system, the fourth is the normalization of design and parts and design procedure. EC and SI are effective methods for them. In addition, the combination of EC and neural network (NN) is effective for autonomous generation such as the circuit, machine, and system structures, circuit parameters, modeling, and so on.

The restriction setting in the circuit design is important and difficult. Due to this reason, partial developments would be proceeded. The system design and parameter optimization have similar difficulties, but it is relatively simple. Therefore, the AI can contribute effectively to them, and they have been developed before anything else. The papers concerned with the optimization of power line including the renewable energy system, which consists of emergency generator, photovoltaics, and batteries, has been reported.

Some examples are introduced below.

According to [17] and [18], the NN and EC are applied to not only the power system but also the renewable energy system. They have been studied since around 2011. The EC or SI is also applied to the electric machine design [19]-[21].

Control

It is important for the AI applications to the control in the power electronics to derive the model of control target. In this process, the k-nearest neighbour (k-NN), general linear model (GLM), support vector machine (SVM), and NN are utilized. Sometimes, these methods are combined with the EC and SI. In this AI application, the AI mostly rather tunes the feedback controller in advance to easily correspond to various disturbances without learning than derives the complicated system model such as the non-linear model. The AI is only applied to the hall thruster engine control on the satellite [3]-[9] and the feedback signals estimation for a vector controlled induction motor drive [22].

EXCELLENT PUBLISHERS

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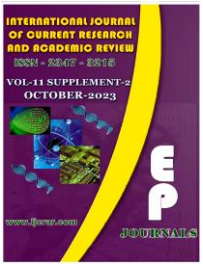

System Operation

The energy management optimization is listed as the AI application to the system operation. The EC and SI are suitable to this application as proposed in [11], [43]. As reported in [44], [45], the NN is applied to predict the output power of photovoltaics (PV) in the operation of micro grid including renewable energy sources. There are relatively many papers concerned with this topic. For the PV output power prediction using NN, its number of papers and transition are described in Fig. 3. In the search style, photovoltaic, forecast, and neural network are chosen as the keywords for the NN. Also, photovoltaic, forecast, and deep learning (DL) are chosen as the keywords for the DL. The search results are compensated to omit the double count. The keywords in the search style for the compensation process are set to photovoltaic, forecast, neural network, and deep learning. The number of papers obtained by the compensation process is subtracted from the search result of NN and is added to the search result of DL. The error rate of search is 0.08 (3/38) here. It seems the AI applications to the detection or prediction of degradation, failure, and abnormalities are the most effective and quickly provides benefits.

At first, the acquired data should be modified for the learning process of AI. For instance, the k-NN, GLM, SVM, and NN are utilized for the regression analysis, which estimates a variable from the acquired data. The decision tree (DT), k-NN, naive Bayesian classifier (NBC), SVM, and NN are utilized for the classification. These AI methods brings deriving the failure (prediction) model. When the system has dominant non-linearity, the AI should be applied. In such a case, the k-NN, GLM, SVM, and NN are chosen as a suitable method. Nowadays, the RL and deep AE are strived to be utilized for the failure diagnosis and detection of motors [46]-[48], and for the failure detection of switching power supplies [49], however, the number of publications concerned with this application is still few.

AI Methods for Power Electronics

Overview

From the past publishes, it seems that AI methods listed in Section 2, which are the multi- layer NN, GA, and particle swarm optimization (PSO), are especially important for AI applications to

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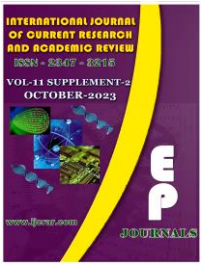

the power electronics. It can be also said that recent trends of AI applications accelerate the application of DL. The multi-objective optimization would increase its importance to balance the specification, cost, and environmental load. Therefore, the multi-layer NN, GA, PSO DL, and multi-objective optimization are introduced from the point of view of AI applications to the power electronics. Table 1 shows the advantages, disadvantages, and applications of each AI method to compare each other. The multi-layer NN has many nodes, which are dividedly included in multiple layers. The layers are divided into the input, hidden, and output layers. A non-linear activation function is utilized in the hidden and output layers. Nodes in a layer are connected to nodes in a next layer. Connections of nodes has a weight. A signal in the input layer is propagated to the output layer through multiple hidden layers in one direction.

Deep Learning

By definition, the multiple layer NN which simply has more than four layers are called deep neural network (DNN). The machine learning method using DNN is the DL. The network called convolution NN (CNN) is widely and practically used for DNN. The CNN was proposed by Toronto University, who made an opportunity to be focused on the DL, and is mainly utilized for the character or object recognition. The DL realizes an automation of feature extraction, which was conventionally carried out manually, by the learning. Also, an immutable internal expression can be learned by the DL [52]. In the AI applications to the power electronics, the DL is applied to the PV output power prediction and failure detection of electric machines. Although huge amount of data acquisition is the issue, the DL would be spread to be applied widely.

Conclusion

This paper classifies the AI applications to the power electronics into four fields: i) Circuit, machine, and system design, ii) control, iii) system operation, and iv) detection or prediction of degradation, failure, and abnormalities. After categorizing, the AI methods which can be applied to these four fields are introduced. The overview of features and current situations about these four fields are given, and the papers concerned with the AI applications to the power electronics are introduced. Furthermore, the trend of study is analyzed by investigating published papers of IEEE Xplore data base. The following AI methods utilized in these AI applications are briefly

EXCELLENT PUBLISHERS

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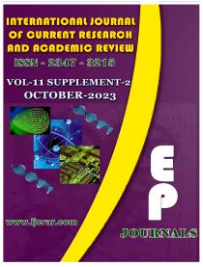

explained, that is, the multilayered neural network, deep learning, genetic algorithm, particle swarm optimization, and multi-objective optimization. The AI applications to the power electronics in the renewable energy system attracting attention as a solution of the worldwide important environmental issue are introduced.

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International Journal of Current Research and Academic Review

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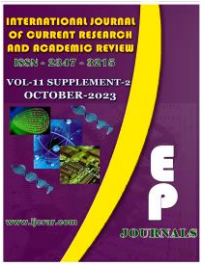

Full Length Article **IJCRAR/FL/89**

A Review on Synthesis of CUO NPS Using Probiotics and its Antimicrobial Activity

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Abstract

The current study illustrates the process by which probiotic bacteria (Lactobacillus casei subsp. produce copper oxide nanoparticles (CuO NPs) and illustrates how these nanoparticles are hazardous to both gram-negative and gram-positive bacteria.In contrast to other nano-sized metals like silver or zinc oxide nanoparticles, bioactive copper nanomaterials are an emerging class of nano-antimicrobials that offer complementary actions and properties. This chapter reviews and categorizes copper nano-antimicrobials, first in terms of preparation techniques and then in terms of the target microorganisms utilized to assess their antimicrobial efficacy. The microbial species and the one being studied setup affect the antibacterial activity of copper-based nanostructures. As a result, this chapter includes information on procedures as well as experimental specifics such contact time, microorganism strain, species that interact concentration, etc. Finally, a brief discussion of copper-based nanoantimicrobials' real-world uses follows as casei.

Keywords: Antimircrobial, Copper NPs

Introduction

Nanotechnology is the study and control of matter at the nanoscale, with dimensions ranging from 1 to 100 nanometers, where unique phenomena allow for novel applications. At the nanoscale, matter can have remarkable physical, chemical, and biological properties that differ significantly from bulk materials, single atoms, and molecules. When compared to other forms or

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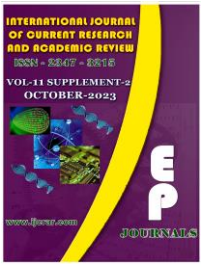

sizes of the same material, some nanostructured materials are stronger or have different magnetic characteristics. Others excel at transferring heat or electricity. As their size or structure changes, they may become more chemically reactive, reflect light better, or change colour.

The prefix "nano" in the International System of Units denotes one billionth (10-9), so one nanometer is one billionth of a metre. To give you an idea of how small that is, consider the following:

- A sheet of paper has a thickness of 100,000 nanometers.
- The diameter of a strand of human DNA is 2.5 nanometers.
- One inch has 25,400,000 nanometers.
- The width of a human hair is between 80,000 and 100,000 nanometers.
- A single gold atom has a diameter of about a third of a nanometer.

A sphere with a diameter of 1 nm is comparable to a softball, and a softball is comparable to the Earth. Three visual illustrations of the size and scale of nanotechnology are shown in the figure on the right.

As scientists utilise the unique features of tomic and molecular assemblages produced at the nanoscale scale, nanotechnology has become one of the most important research pursuits of the early twenty-first century. Researchers can rationally design and use nanoparticles for medication administration, as image contrast agents, and for diagnostic purposes thanks to our capacity to modify the physical, chemical, and biological properties of these particles.

The combination of these new skills, along with developments in imaging, bioinformatics, and systems biology, holds a lot of promise for solving some of biology's most difficult biochemical and genetic challenges. Although many technical advances are aiding biology now, few will have the paradigm-shifting impact on basic research, drug development, and clinical medicine as nanotechnology will (Scott E. McNeil, 2005).

Human imagination and fantasies are frequently the source of new science and technology. Nanotechnology, a twenty-first-century frontier, arose from such fantasies. Nanotechnology is described as the study and control of matter at scales of 1 to 100 nanometers, where unusual occurrences allow for fresh applications (JE Hulla, SC Sahu, AW Hayes, 2015).

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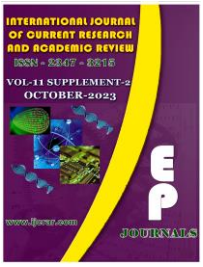

Recently, carbon nanotubes were shown to penetrate tomato seeds2, while zinc oxide nanoparticles were discovered to infiltrate ryegrass root tissue. This shows that new nutrient delivery systems can be created that take advantage of nanoscale porosity domains on plant surfaces. Reduced research funding and a lack of clear rules and innovation policies may have hampered the potential use of nanotechnology to improve fertiliser formulations (Maria C. DeRosa, Carlos Monreal, Morris Schnitzer, Ryan Walsh & Yasir Sultan, 2010).

Classification of Nanoparticles

Organic, inorganic, and carbon-based nanoparticles are the most common types.

Organic Nanoparticles

There is a far better grasp of how things come to be.There are more inorganic particles than organic particles. There have been some exciting advancements in protein crystallisation.recently, which has an impact on the traditional field of theory of nucleation In the field of research, there is still a significant demand.For instance, in nucleation theory, the interaction of several components are involved in particle production (Dieter Horn and Jens Rieger, 2001)

Inorganic Nanoparticles

Than most absorbing and scattering organic materials Because of the collective oscillation of free electrons in their conduction bands, plasmonic gold nanoparticles have unique size-dependent optical and photothermal features [11]. Gold nanoparticles have a substantially higher light scattering intensity (Huang-Chiao Huanga Sutapa Baruaa Gaurav Sharmad Sandwip K.Deyb Kaushal Regeac, 2011).

Carbon Based Nanoparticles

CNTs are a nano-sized hollow cylindrical form of carbon that was first produced in 1991 by Lijima. 36 CNTs have since been used in a variety of scientific and technological domains. Kang *et al*. (2007) were the first to establish that SWCNTs have potent antibacterial action against E. coli

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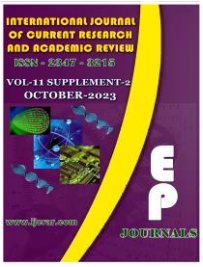

(*E. coli*). They proved that SWCNTs can induce serious membrane damage and cell death.(Adv Pharm Bull. 2015).

Metal Based Nanoparticles

Nanoparticles' revolutionary potential continues to captivate academics, medical professionals, and consumers alike, with new advancements expected to culminate in a one-trillion-dollar market by 2015. 1–3 NPs with lengths of 1–100 nm will be explored in this paper, with a focus on their unique physicochemical features not seen in typical bulk materials (Amanda M. Schrand, Mohammad F. Rahman, Saber M. Hussain, John J. Schlager, David A. Smith, Ali F. Syed. 2010.).

Metal Oxides Based Nanoparticles

Metal oxide nanofluids have not yet been used for EOR applications, including stability testing and coreflood studies with light crude oil and Berea sandstones in various wettability systems. This article examines metal oxide NPs in various initial rock wettability regimes in order to assess these materials as prospective EOR alternatives. Direct visual inspection, surface conductivity testing, and particle size analysis were used in experimental research on nanofluid stabilities (Luky Hendraningrat & Ole Torsæter, 2015).

Fullerenes Nanoparticles

Fullerene is a nanomaterial that has potential uses in biomedicine. Researchers discovered photoinduced cytotoxicity and photo-induced DNA cleavage activity 22, as well as antiviral properties against HIV-1 in acutely and chronically infected cells 23, in 1993. This effect was inserted through inhibition of the HIV protease 19, 23, 24, and reverse transcriptase 19, 23. Following this curiosity-driven route, subsequent investigations showed its significant biological activity (ZeinabMousavi, 2017).

Graphene Nanoparticles

Graphene/nanoparticle hybrids may be made using a variety of approaches. Based on the structural morphologies of the resultant hybrids, we divide these synthesis procedures into two

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International Journal of Current Research and Academic Review

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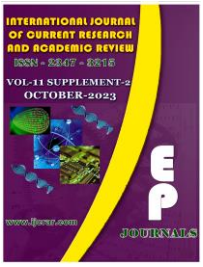

categories in this section: (1) nanoparticles that are painted on graphene or graphene derivatives, and (2) nanoparticles that are enveloped in graphene or graphene derivatives (Kim Truc Nguyen a and Yanli Zhao.. 2014).

Carbon Nano Tubes Nanoparticles

The carbon arc approach reported by Ebbesen and Ajayan3 was used to make nanotubes and nanoparticles. In 900 Torr of helium, a dc arc plasma was produced between a 12" graphite negative electrode and an 8-mm positive electrode (Louis S. K. Pang.John D. Saxby and S. Peter Chatfield, 1993).

Carbon Nanofiber Nanoparticles

Applied Sciences Inc. provided carbon nanofibers (Pyrograf III, pyrolytically stripped, diameter 100-200 nm, length 30-100 m). The manufacturer had pyrolytically stripped the as-grown nanofibers to eliminate polyaromatic hydrocarbons (Wei Xia, *et al.*, 2005).

Carbon Black Nanoparticles

SDS-modified CBs were combined with an appropriate amount of epoxy (EP) and then mechanically mixed with polyamide hardener. The resin was mixed with modified CB nanoparticles and swirled for 2 hours at 2000 rpm. (Ahmad Ghasemi-Kahrizsangia, 2015).

Copper Oxide Nanoparticles

Intrinsiq Materials Ltd. (Farnborough, UK) used thermal plasma (TesimaTM) technology to create nanoparticles of CuO, Cu, Cu2O, zinc oxide (ZnO), and silver (Ag). This method enables for continuous bulk nanopowder manufacturing in the gas phase (Guogang Rena, 2008). Copper oxide (CuO) nanoparticles were used to determine particle size, shape, and composition (Dawei Hub, 2008). In a round bottom flask, make aqueous copper acetate solution (0.02 mol). 1 mL glacial acetic acid is added to the aforementioned aqueous solution and heated to 1000°C while stirring constantly (Amrut. S. Lanje, 2010).

EXCELLENT PUBLISHERS

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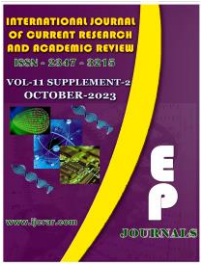

DLS was used to determine the size of particles and agglomerates in cell media using a Zetasizer nano ZS (Malvern, UK). The zeta potential is determined by passing an electrical current through the solution, and particles with various charges migrate at varying speeds toward the electrodes, which is measured and translated to zeta potential using Smoluchowski's theory (Hanna L. Karlsson, 2008).

Several studies have looked at the varied effects Copper nanoparticles (CuNPs) and Copper oxide nanoparticles (CuONPs) have on microorganisms. Copper oxide nanoparticles (CuNPs) are more likely to interact with bacterial membranes, affecting their integrity (Maria Laura Ermini. and Valerio Voliani, 2021). For narrow size dispersed metal nanoparticles, Reetz *et al*. [25] used an electro reduction technique to synthesizes copper oxide nanoparticles. Cluster size was shown to decrease as current density increased (Sunita Jadhav, 2011). Because the substance is insoluble in the solvent mixture utilized, the preparation was as easy as decantation and vacuum drying, and the vials were kept as closed glass vials under ambient conditions for future studies.

As a result, the anode oxidizes the bulk metal, the metal cations migrate to the cathode, and reduction occurs with the creation of metal or metal oxide in the zero oxidation state (Suresh Gaikwad, 2011). Copper (Cu) was used as a sacrificial anode in the first reported copper oxide (CuO) nanocrystals. Copper oxide nanoparticles (CuO NPs) were made by mixing sodium hydroxide solutions at different concentrations with copper acetate solutions in ethanol/water (Madalina Elena Grigore, 2016).

The introduction of nanotechnology in biomedical research has resulted in a dramatic increase in research employing copper oxide (CuO) nanoparticles. Because of their large specific surface area and ability to promote electron transfer processes at lower over-potential, they have been widely employed in no enzymatic sensing of therapeutically relevant analyses. 35-38 (Nishant Verma, 2019).

The goal of this study is to provide a complete overview of recent advances in various methodologies used to synthesized copper oxide (CuO) nanoparticles of all oxide types, as well as the growth mechanisms involved in establishing the final shape and a full discussion of their biological uses (Nikhil Kumar, 2019).

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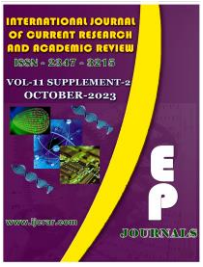

On a PerkinElmer Spectrum, the purified Copper oxide NPs' Fourier Transform Infrared (FTIR) spectra were recorded. One instrument with a 2 cm1 resolution.

Purified Copper oxide NPs were crushed with KBr pellets to make FTIR samples. (TEM) tests were carried out using a JEOL model 1200EX apparatus with a 120 kV accelerating voltage (Syed Saif Hasan, 2008).

Biosynthesis of Nanoparticles

We outline the traits that should be inherent for the formation of nanoparticles with desired characteristics and review some of the organisms utilised in nanomaterial biosynthesis. Plectonema boryanum UTEX 485, a filamentous cyanobacterium, was used to obtain morphological control over the form of gold nanoparticles (Prashant Mohanpuria, 2008).

Scientists have recently grown increasingly interested in the interaction of inorganic compounds with biological organisms. Many bacteria may create inorganic nanoparticles via intracellular or extracellular pathways, according to research (Xiangqian Li, 2011). For the creation of nanoparticles, a number of chemical and physical preparation procedures are available (Cheah Liang Keat, 2015).

The precise process for production of nanoparticles with biological agents has yet to be established. This is due to the fact that various biological agents react differently with metal ions, resulting in nanoparticle production. Many microbes create inorganic elements both within and outside the cell (Nasreen. I . Hulkoti, 2014).

Most microorganisms, including bacteria, fungus, yeast, and algae, are capable of producing nanoparticles. The reduction of metal ions to nanoparticles is the basic concept of synthesis (Kapil Punjabi, 2014). Carbonyl groups, terpenoids, phenolics, flavonones, amines, amides, proteins, pigments, alkaloids, and other reducing agents found in plant extracts and microbial cells can all stimulate the formation of nanoparticles (Asmathunisha.2012).

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International Journal of Current Research and Academic Review

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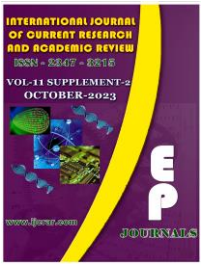

Although chemical processes are utilised in the mass manufacture of nanoparticles, the major product formed in the synthesis of nanoparticles tends to cause pollution, posing a harm to life on land and in water, and accumulating in the environment.(N. Asmathunisha, K. Kathiresan.2012). Biosynthesis of diverse metallic and metal oxide NPs is simple to handle since they develop quickly and have a high biomass growth rate.(Rimsha Chaudhary 1.2020) T. terrestris filtrate was combined with a volume concentration of 5 mM aqueous CuSO4.5H2O to make CuONPs. The reaction mixture was vigorously agitated and heated for about 120 minutes at 90° C. A brown–black coloured product was produced after cooling the reaction mixture to room temperature and was collected by centrifugation at 16,000 rpm for 15 minutes and washing with DI water (Gopinath, 2016).

Microbes are good candidates for both intracellular and extracellular synthesis of metallic nanoparticles. Shape, size, and distribution of particles, as well as topography, purity, stability, dispersion, reactivity, and hydrophobocity, are all essential physicochemical features of nanoparticles (Kumar and Dixit, 2017).

Bacterial Mediated Copper Oxide Nanoparticles Synthesis

The use of biological synthesis to make nanoparticles has grown increasingly popular. The diverse kingdoms of life have huge, unexplored collections of nanoparticle generating agents due to their well-known capacity to create inorganic materials.(Syed Saif Hasan1.2008). There have been some successful attempts to create metal nanoparticles, but they are mostly restricted to chemical processes (Rajesh Ramanathan, 2011).

Toxic chemicals and energy-intensive pathways are used in physico-chemical procedures, making them environmentally dangerous and preventing their use in biomedicine and therapeutic applications. As a result, existing nanomaterials production methodologies require the development of environmentally friendly protocols (Ajay V. Singh, 2010). Thymbra spicata was gathered in Turkey's south-eastern Anatolia for nanoparticle synthesis. A mixture of 10 g of dried T. spicata leaf and 100 mL deionized water was cooked for 30 minutes at 60 C. (Fatih Erci.2020).

EXCELLENT PUBLISHERS

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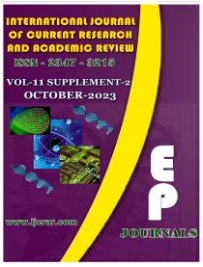

In this study, we used an aqueous extract of the A. indica leaf to synthesise copper oxide nanoparticles. The current work continues to evaluate the antibacterial and cytotoxicity properties of copper oxide nanoparticles mediated by *A. indica* (Rajeshwari Sivaraj, 2014).

The hue of the fluid changed to dark brown after adding ammonium hydroxide. To create the gel, the reaction mixture was stirred for 8 hours on a magnetic stirrer. The precipitate was centrifuged and carefully rinsed with distilled water before being heated in a hot air oven at 80 °C for 8 hours to remove free nitrate ions, organic contaminants, and excess ammonia. In a muffle furnace, the material was heated to 500°C for 3 hours to convert hydroxide to copper oxide (A.P. Angeline Marya, 2019).

Characterization of synthesized Copper oxide nanoparticles

Shraddha shirsat *et al*. (2019) characterise generated copper oxide nanoparticles using UV-visible spectroscopy and scanning electron microscopy (Scanning Electron Microscopy). They determined that the greatest absorption of CuO-NPs is 260 nm using UV-visible spectroscopy (Thermo Scientific UV-10) to explore the optical characteristics of copper oxide nanoparticles. SEM is used to characterise CuO-NPs, and the individual width of nanostructured clusters is measured in the 100 nm to 500 nm range.

To characterise generated copper oxide nanoparticles, Maqusood Ahamed *et al*. (2014) employed X-ray diffraction, Field emission transmission electron microscopy, and Field emission scanning electron microscopy coupled with Energy dispersive X-ray spectroscopy. XRD is used to study the nanoparticle's crystalline nature, revealing the existence of a prominent peak with a crystalline size of 23.43 nm. FESEM and FETEM were used to analyse the structural nature of CuO-NPs, which indicated that the average size is about 23.17 nm, which is compatible with the XRD findings. They also utilised EDS to assess the purity of CuO-NPs generated in the lab, which exhibited no extra usual contaminants' peak, suggesting that the CuO nanoparticles were of good quality.

The physio-chemical characteristics of CuO-NPs were investigated using UV-Vis spectrophotometer, FE-SEM, XRD, and EDS by Pardeep Kumar *et al*. (2020). One absorption peak

EXCELLENT PUBLISHERS

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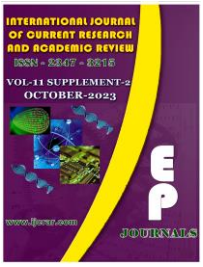

at 265 nm and another wide resonance centred peak at 670 nm are detected in UV-visible spectroscopy of biosynthesized copper oxide nanoparticles between 250 and 800 nm. They believe that the peak at 265 nm is generated by a CuO band edge transition, whereas the peak at 670 nm is caused by an inter-band transition of copper metal core electrons. An XRD diffractogram of CuO-NPs is used to investigate the formation of highly crystalline CuO-NPs with distinct and strong peaks. The diameter range of nanoparticles between 20 and 80 nm was identified by FE-SEM, revealing the generation of slightly agglomerated spherical NPs.

The synthesis of CuO-NPs was confirmed by energy dispersive X-ray analysis (EDX), which revealed significant Cu and O peaks. As a result of utilising the carbon tape to monitor the sample, a carbon peak is visible in this analysis. To characterise bacterial synthesised CuO NRs, Hina Qamar *et al*. (2020) used UV visible spectroscopy, Zeta sizer equipped with Zeta potential, Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), Scanning electron microscopy (SEM) equipped with Energy dispersive X-ray spectroscopy (EDS), Scanning electron microscopy (SEM (TEM). In UV-Visible spectroscopy, the absorption spectra of bacterial mediated-produced CuO NRs were recorded from 200–600 nm, exhibiting a single absorbance peak at 246 nm.

Using Zetasizer's dynamic light scattering (DLS), they discovered that the average hydrodynamic diameter of CuO NRs is 90 5 nm. A strong peak in the infrared spectrum at low frequencies of roughly 590.4–628.2 cm1 was discovered by FTIR investigation, showing CuO vibration. XRD was used to analyse the crystalline structure of CuO NRs, and an average crystallite size of 6 nm was calculated using Debye Scherrer's equation (D =K/ (cos)). SEM/EDS analysis was used to assess the morphology and percentage of elemental content of synthesised CuO-NRs. TEM analysis revealed nanoparticles with a diameter of 61.48 2 nm and a length of 400–500 nm.

As confirmation of the foregoing research, the physio-chemical properties of CuO nanoparticles were investigated using various analytical techniques such as TEM, SEM, UV-Visible spectroscopy, and FTIR.

EXCELLENT PUBLISHERS

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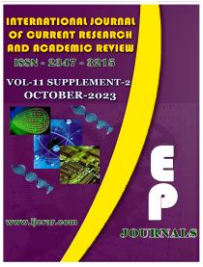

Application of Nanotechnology of Lifescience

Nanotechnology and biotechnology are two of the most promising technologies of the twenty-first century. Nanotechnology is defined as the design, development, and use of materials and devices with the least functional make-up on the nanometer scale (1 to 100 nm). Biotechnology, on the other hand, is concerned with the metabolic and other physiological developments of biological topics, such as bacteria (Ram Prasad, 2019).

The use of nanotechnology for medication delivery has been a significant advancement in therapeutic strategies. Drugs can be transported to specific areas using nanoparticles, which has the benefit of decreasing drug buildup in healthy tissues (Shelley Farrar Stoakes, 2017). Cells in living animals are generally 10 metres in diameter. The cell pieces, on the other hand, are significantly smaller, measuring in the sub-micron range. Proteins are even smaller, with a mean size of only 5 nm, equal to the dimensions of the tiniest artificial nanoparticles (OV Salata, 2004).

Nanotechnology is a branch of technology that brings together a diverse group of experts, including physicists, chemists, mathematicians, biologists, physicians, and engineers, to advance study beyond traditional disciplinary lines.

Nanotechnology's vision focuses on a variety of social goals, including better understanding of nature, enhanced production, improved health care, and pushing the boundaries of sustainable development and human potential (Costas A. Charitidis, 2015).

It refers to a set of technologies that are being applied to a variety of existing industries. Nanoelectronics, nanomaterials, and nanobiotechnology are three overlapping areas that find applications in fields such as electronics, materials, environment, metrology, robotics, healthcare, information technology, pharmaceutics, agriculture, and transportation (Vijaya Shanti Bheemidi, 2011).

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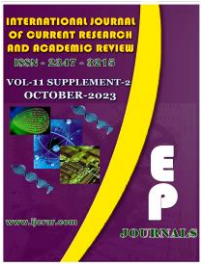

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EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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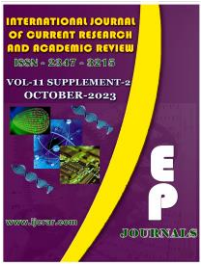

Full Length Article **IJCRAR/FL/90**

Data Science and Prediction

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Abstract

The use of the term "Data Science" is becoming increasingly common along with "Big Data." What does Data Science mean? Is there something unique about it? What skills should a "data scientist" possess to be productive in the emerging digital age characterized by a deluge of data? What are the implications for business and for scientific inquiry? In this brief monograph I address these questions from a predictive modeling perspective.

Keywords: Data Science, deluge of data

Introduction

The use of the term "Data Science" is becoming increasingly common along with "Big Data." What does Data Science mean? Is there something unique about it? What skills should a "data scientist" possess to be productive in the emerging digital age characterized by a deluge of data? What are the implications for scientific inquiry?.

The term "Science" implies knowledge gained by systematic study. According to one definition, it is a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe.1 Data Science might therefore imply a focus around data and by extension, Statistics, which is a systematic study about the organization, properties, and analysis of data and their role in inference, including our confidence in such inference. Why then do we need a new term, when Statistics has been around for centuries? The

EXCELLENT PUBLISHERS

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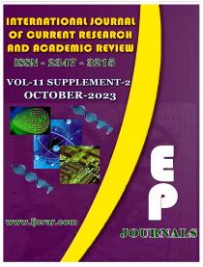

fact that we now have huge amounts of data should not in and of itself justify the need for a new term.

The short answer is that it is different in several ways. First, the raw material, the "data" part of Data Science, is increasingly heterogeneous and unstructured – text, images, and video, often emanating from networks with complex relationships among its entities. Figure 1 shows the relative expected volumes of unstructured and structured data between 2008 and 2015, projecting a difference of almost 200 pedabytes in 2015 compared to a difference of 50 pedabytes in 2012. Analysis, including the combination of the two types of data with requires integration, interpretation, and sense making, increasingly based on tools from linguistics, sociology, and other disciplines. Secondly, the proliferation of markup languages, tags, etc. are designed to let computers interpret data automatically, making them active agents in the process of sense making. In contrast to early markup languages such as HTML that were about displaying information for human consumption, the majority of the data now being generated by computers is for consumption by other computers. In other words, computers are increasingly doing the background work for each other. This allows decision making to scale: it is becoming increasingly common for the computer to be the decision maker, unaided by humans. The shift from humans towards computers as decision makers raises a multitude of issues ranging from the costs of incorrect decisions to ethical and privacy issues. These fall into the domains of business, law, ethics, among others.

From an epistemological perspective, the data explosion makes it productive to visit the age old philosophical debate on the limits of induction as a scientific method for knowledge discovery. Specifically, it positions the computer as a credible generator and tester of hypotheses by ameliorating some of the known errors associated with statistical induction. Machine learning, which is characterized by statistical induction aimed at generating robust predictive models, becomes central to Data Science.

From an engineering standpoint, it turns out that scale matters in that it has rendered the traditional database models somewhat inadequate for knowledge discovery. Traditional database methods are not suited for knowledge discovery because they are optimized for fast access and summarization of data given what the user wants to ask (i.e. a query), not discovery of patterns in

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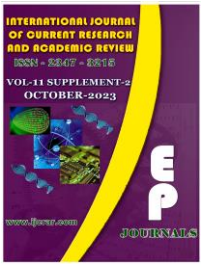
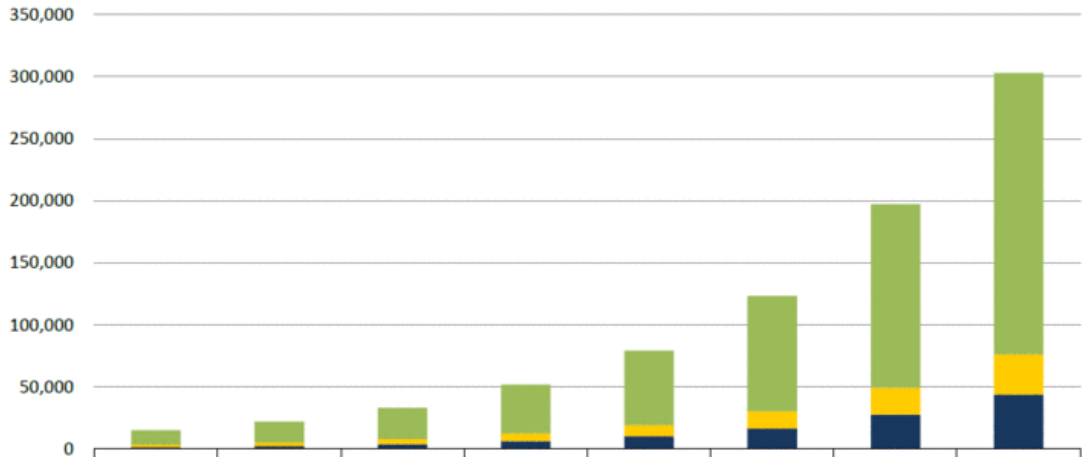


massive swaths of data when the user does not have a well formulated query. Unlike database querying which asks "what data satisfy this pattern (query)," discovery is about asking "what patterns satisfy this data?" Specifically, our concern is finding interesting and robust patterns that satisfy the data, where interesting is usually something unexpected and actionable, and robust means a pattern that is expected to occur in the future.

Total Archived Capacity, by Content Type, Worldwide, 2008-2015 (Petabytes)



	2008	2009	2010	2011	2012	2013	2014	2015
Unstructured	11,430	16,737	25,127	39,237	59,600	92,536	147,885	226,716
Database	1,952	2,782	4,065	6,179	9,140	13,824	21,532	32,188
E-mail	1,652	2,552	4,025	6,575	10,411	16,796	27,817	44,091

Source: Enterprise Strategy Group, 2010.

Implications for Business

According to recent report by McKinsey and Company3, the volume of data is growing at a rate of roughly 50% per year. This translates into a roughly 40-fold increase in ten years. Hundreds of billions of messages are transmitted on social media daily and millions of videos are uploaded daily across the Internet. As storage becomes virtually costless, most of this information is stored because businesses generally associate a positive option value with data. In other words, since it

EXCELLENT PUBLISHERS

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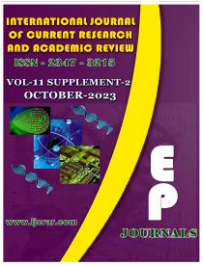

may turn to be useful in ways not yet foreseen, why not just keep it? (An indicator of how cheap storage has become is the fact that it is possible to store the world's current stock of music on a $500 device!).

The viability of using large amounts of data for decision making became practical in the 80s. The field of "Data Mining" started to burgeon in the early 90s as relational database technology matured business processes became increasingly automated. Early books on Data Mining4 5 6 from the 90s described how various methods from Machine Learning could be applied to a variety of business problems. There was a corresponding explosion in the available software tools geared towards leveraging transactional and behavioral data for purposes of explanation and prediction.

An important lesson learned during the 90s was that machine learning "works" in the sense that these methods detect subtle structure in data relatively easily without having to make strong assumptions about linearity, monotonicity, or parameters of distributions. The downside is that these methods is that they also pick up the noise in data7 and often have no way of distinguishing between what is signal and what is noise, a point we return to shortly.

Despite the drawbacks, there is a lot to be said for methods that don't force us to make assumptions about the nature of the relationship between variables before we begin our inquiry. This is not a trivial issue. Most of us are trained to believe that theory must originate in the human mind based on prior theory and data is then gathered to demonstrate the validity of the theory. Machine Learning turns this process around. Given a large trove of data, the computer taunts us by saying "If only you knew what question to ask me, I would give you some very interesting answers based on the data!".

It is non-trivial to extract the interesting patterns from a large temporal database of the type above. For starters, the raw data across individuals typically needs to be aggregated into some sort of canonical form before useful patterns can be discovered. For example, suppose we count the number of prescriptions an individual is on at every point in time without regard to the specifics of each prescription as one approximation of the "health" of an individual prior to

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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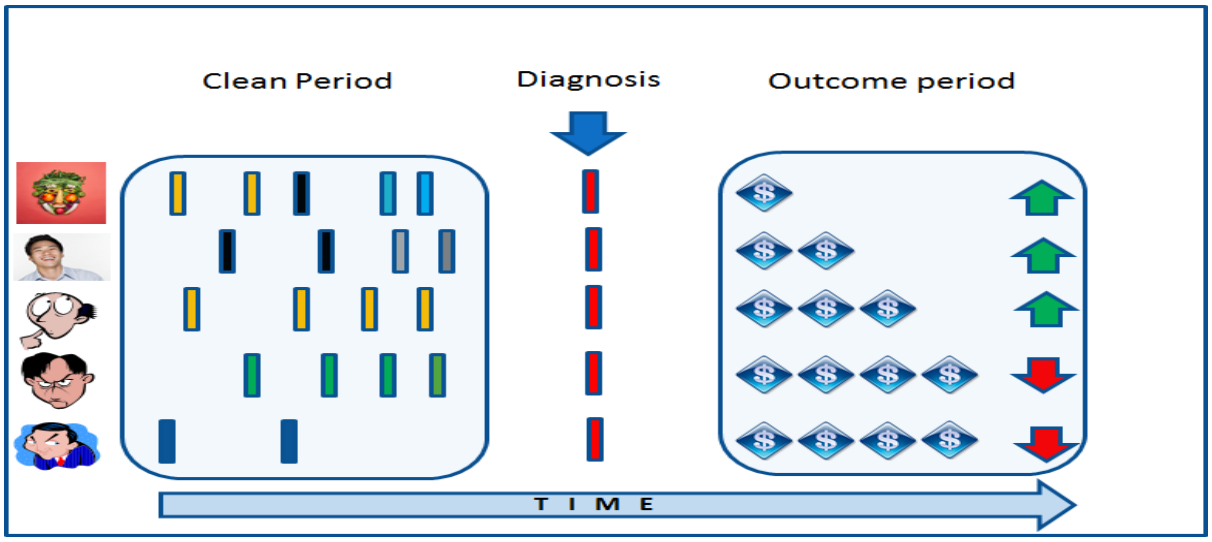
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

diagnosis. Another identifier might be the specific medications involved, where green and blue might be "severe" medications.



From the above data, a "complications database" might be synthesized from the raw data. This might include demographic information such as a patient's age and their medical history including a list of current medications aggregated into a count in which case we get a summary table of the type below. A learning algorithm, designated by the right facing blue arrow in Figure 3, could then be applied to discover the pattern shown on the right of the table. The pattern represents an abstraction of the data. Essentially, this is the type of question we should ask the database, if only we knew what to ask!

Why is the pattern on the right side interesting? To appreciate this, suppose the overall complication rate in the population is 5%. In other words, a random sample of the database would on average, contain 5% complications. Under this scenario, the snippet on the right hand side could be very interesting since its complication rate is many times greater than the average. The critical question here is whether this is a pattern that is robust and hence predictive, that is,

International Journal of Current Research and Academic Review
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Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

likely to hold up on unseen cases in the future. The issue of determining robustness has been addressed extensively in the machine learning literature.

Patient	Age	#Medications	Complication
1	52	7	Yes
2	57	9	Yes
3	43	6	Yes
4	33	6	No
5	35	8	No
6	49	8	Yes
7	58	4	No
8	62	3	No
9	48	0	No
10	37	6	Yes

Age >= 37
AND
#Medications >= 6
→
Complication = Yes (100% confidence)

If the above table is representative of the larger database, the box on the right tells us the interesting question to ask our database, namely, "What is the incidence of complications in Type 2 diabetes for people over 36 who are on more than five medications?" In terms of actionability, such a pattern would suggest being extra vigilant about people with this profile who do not currently have a complication because of their high susceptibility to complications.
The general point is that when the data are large and multidimensional, it is practically impossible for us to know a priori that a query such as the one above is a good one, that is, one that provides a potentially interesting insight. Suitably designed machine learning help find such patterns for us. Equally importantly, these patterns must be predictive. Typically, the emphasis on predictability favors Occam's razor since simpler models generally have a higher chance of holding up on future observations than more complex models, all else being equal.9 For example, consider the diabetes complication pattern above:

Age > 50 and #Medication > 6 □ Complication_rate=100%

is to"train" a computer to interpret questions correctly based on large numbers of examples.

When predictive accuracy becomes a primary objective, the computer tends to play a significant role in model building and decision making. It builds predictive models through an intelligent

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International Journal of Current Research and Academic Review

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Journal home page: http://www.ijcrar.com

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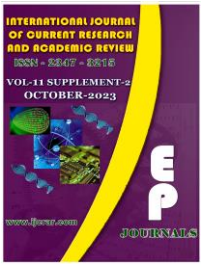

"generate and test" process, the end result of which is an assembled model that is the decision maker. In other words, it takes automates Popper's criterion of predictive accuracy for evaluating models at a scale that has not been feasible before. It is notable that the powerhouse organizations of the Internet era which include Google, and Amazon, and most of the emerging Web 2.0 companies have business models that hinge on predictive models based on machine learning. Indeed the first machine that could arguably be considered to pass the Turing test, namely, IBM's Watson, could not have done so without extensive use of machine learning in how it interpreted questions. In a game like jeopardy where understanding the question itself is often a nontrivial task, it is not practical to tackle this problem through an extensive enumeration of possibilities. Rather, the solution is to "train" a computer to interpret questions correctly based on large numbers of examples.

Knowledge Discovery

In his provocative article titled "The End of Theory: The Data Deluge Makes the Scientific Method Obsolete13," Chris Anderson drew on the famous quote by George Box that "All models are wrong, but some are useful," arguing that with the huge amounts of data now available, we don't need to settle for wrong models or any models for that matter. Anderson pointed out that prediction is of paramount importance to businesses, and that data can be used to let such models emerge using machine learning algorithms, largely unaided by humans. Anderson points to companies such as Google as symbolizing the triumph of machine learning over top-down theory development. Google's language translator doesn't "understand" language, nor do its algorithms know the contents on webpages. Nor does IBM's Watson "understand" the question it is asked. There are dozens of lesser known companies that likewise are able to predict the odds of someone responding to a display ad, etc., without any solid theory, but rather, based on gobs of data about behaviors of individuals and the similarities and differences among these behaviors.

In contrast, the social sciences are generally characterized by incomplete models that are intended to be partial approximations of reality, often based on assumptions of human behavior known to be simplistic. A model that is correct 95% of the time in this world would be considered very good. Ironically, however, the emphasis in social science theory development is on proposing theories that embody causality without serious consideration of their predictive power. When

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International Journal of Current Research and Academic Review

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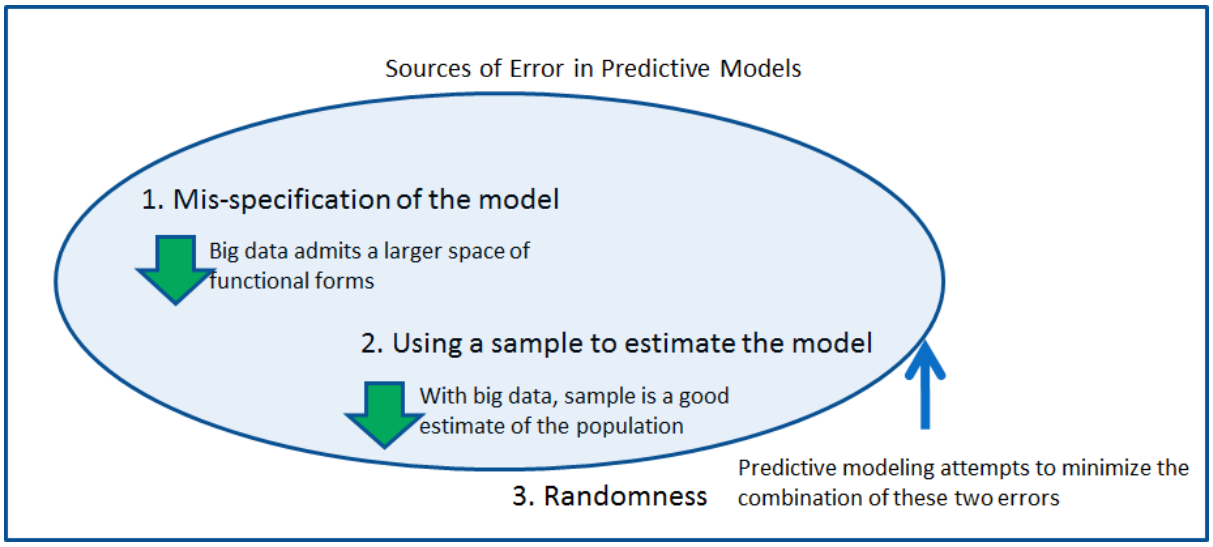
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

such a theory claims that "A causes B" data are gathered to confirm whether the relationship is causal. But its predictive accuracy could be poor because the theory is incomplete. Indeed, it is not uncommon for two experts in the social sciences to propose opposite relationships among the variables and to offer diametrically opposite predictions based on the same sets of facts. Economists, for example, routinely disagree on both theory and prediction, and are often wrong in their forecasts.



The theoretical limitation of observational data, regardless of how big it is, is that it is generally "passive," representing what actually happened in contrast to the multitude of things that could have happened had the circumstances been different. In the healthcare example, it is like having observed the use of the healthcare system passively, and now having the chance of understand it in retrospect and extract predictive patterns from it. The data do not tell us what could have happened if some other treatment had been administered to a specific patient or to an identical patient. In other words, it does not represent a clean controlled randomized experiment where the researcher is able to establish controls and measure the differential impact of treatments on matched pairs.ConcludingThere is no free lunch. While large amounts of observational data provide us with unprecedented opportunity to develop predictive models, they are limited when it comes to explanation19. Since it is impossible to run controlled experiments, except by design,

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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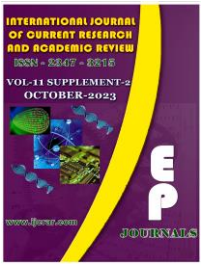

we cannot know the consequences of things that did not transpire. A limitation of this is that we are limited in our ability to impact the future through intervention that is possible when the causal mechanisms are well understood.

The second limitation of predictive modeling with causation is that multiple models that appear different on the surface might represent the same underlying causal structure, but there is no way to know this. For example, in the diabetes example, there could be multiple uncorrelated robust patterns that predict complications.

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EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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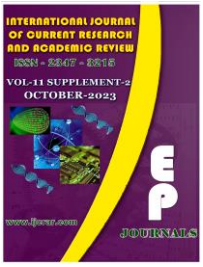
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Full Length Article **IJCRAR/FL/91**

The Recent Trends in Cyber Security: A Review

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Abstract

During recent years, many researchers and professionals have revealed the endangerment of wireless communication technologies and systems from various cyberattacks, these attacks cause detriment and harm not only to private enterprises but to the government organizations as well. The attackers endeavor new techniques to challenge the security frameworks, use powerful tools and tricks to break any sized keys, security of private and sensitive data is in the stale mark. There are many advancements are being developed to mitigate these attacks. In this conjunction, this paper gives a complete account of survey and review of the various exiting advanced cyber security standards along with challenges faced by the cyber security domain. The new generation attacks are discussed and documented in detail, the advanced key management schemes are also depicted. The quantum cryptography is discussed with its merits and future scope of the same. Overall, the paper would be a kind of technical report to the new researchers to get acquainted with the recent advancements in Cyber security domain.

Keywords: Cyber Security, wireless communication technologies and systems

Introduction

The world is experiencing rapid growth in cyberspace today (Arora, 2016). Such an extraordinary growth in information- access gives opportunities to those with malicious intentions. It is the need of the hour (Arora, 2016) and the act of protecting the systems and technologies from unusual activities. Cyber security means maintaining the Integrity, Confidentiality, and Availability (ICA) of computing assets belonging to an organization or connecting to another organization's network. Due to the evolution and increase of cyber threats, many researchers

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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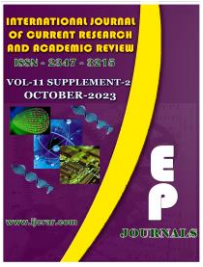

believed and urged to educate the new generation about the concepts of cyber-security (Lunt et al., 2011). Cyber-crimes occur due to negligence in cyber-security and awareness among the clients (Schneier, 2018; Albrechtsen, 2007). As stated in the recent research (Jasper, 2017; Abdallah et al., 2018), the US has introduced the threat intelligence frameworks. This framework works on the principle of gathering information from various sources which have been care- fully examined by human security experts. Besides, researcher also taking aid of machine learning techniques to analyze threats which in advanced way respond to attack incidents (Emmanuel et al., 2020). The United Kingdom has introduced its own National Cyber Security Strategy 2016–2021 that resembles the ideas to that of the 2011 version (Niekerk and Solms, 2013) and has allocated a budget of £1.9bn for the Cyber Security Programme (UKCyber Security Strategy. National Cyber Security Strategy, 2016).

Attacks classification

This section introduces multifarious types of attacks in different domains and is further categorized

Cryptographic attack

Type of attack in which the adversary breaks the cryptography, pragmatically, to discover the shortcoming in an exceeding proto- col, code, or ciphers to retrieve the plaintext without the key.

Access attack

Type of attack where the perpetrator procures ingress to the host's machine where they have no right to use with the intent to manipulate information. Web application services and File Transfer services are being compromised where attackers able to access e-accounts, databases, and other private information.

International Journal of Current Research and Academic Review
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Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Reconnaissance attack

An attack in which the perpetrator maps with targeted systems to scan any vulnerability in the machine to gather information. This is a kind of scenario similar to stealing for instance in the house which is vulnerable to break locks, doors, and windows that are not strong and are joined.

Active attack

An attack, while transmission of data alters the content and affects the operations thereby serve as an intercessor, leads to severe damage.

Passive attack

The database is neither intrudes nor amends by the attacker; however, only monitors the target to access the information throughout the transmission. In other words, the attacker's main aim is to collect the information by listening to a conversation between hosts through several means.

Phishing attack

An act of sending fallacious messages via many ways such as emails, text messages, etc. that tends to become from the legitimate resource, thereby, deceive users and obtain sensitive and confidential information such as login passwords, card numbers.

Malware attack

An attack where a perpetrator deliberately installed malicious software on the host's computer intending to not only proliferate virus, nonetheless but also infect and harm the computer, thereby, gain private data.

Attack on quantum key distribution

An attack has done while transmitting any data through a quantum channel either by forge a single photon, multiple photons, or by time elapsing of pulses.

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International Journal of Current Research and Academic Review

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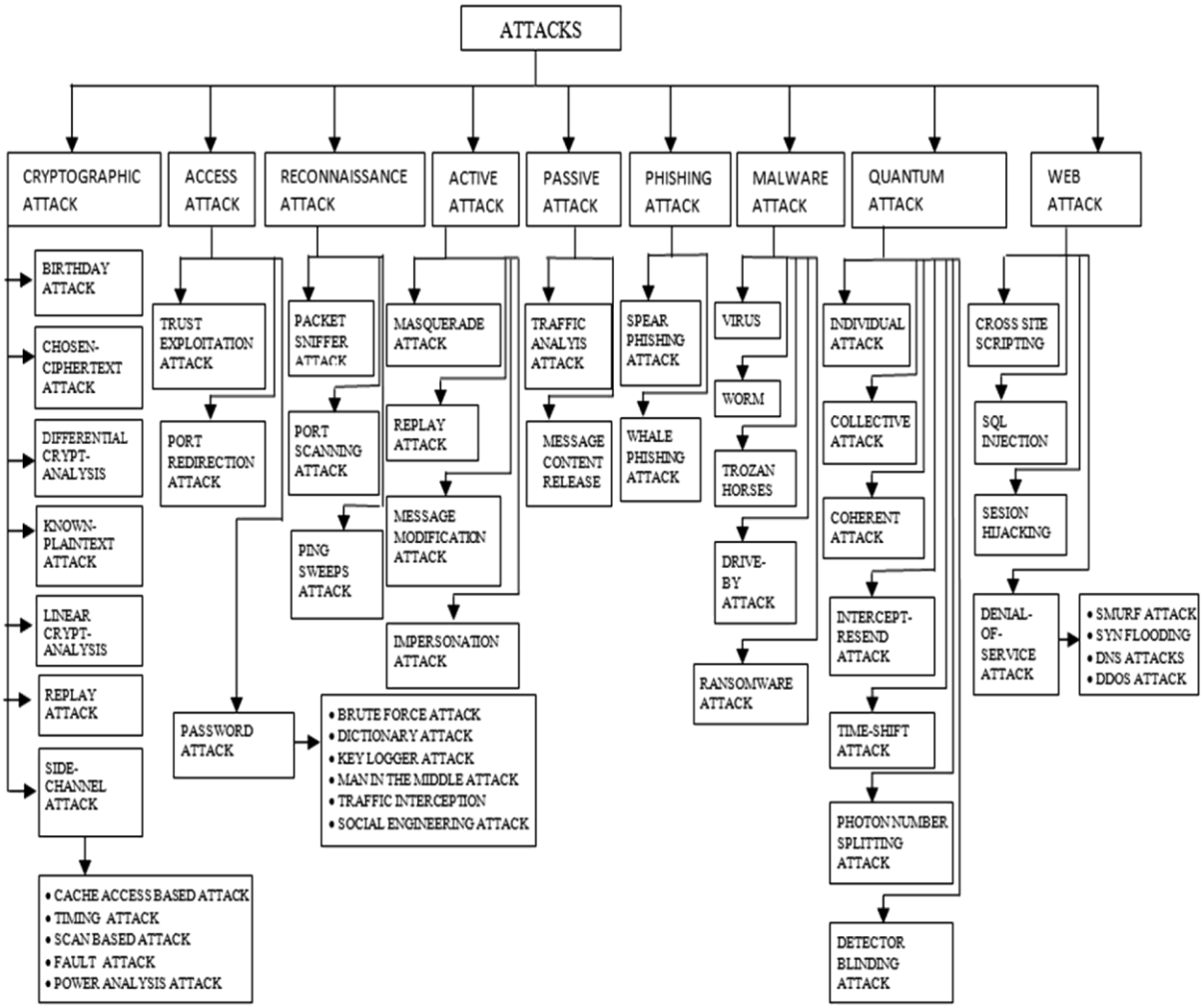

Historical background

Data security is the main challenge of any network communication; hence there exist many algorithms to solve the security issues. The history of cryptography and the encryption algorithms are discussed in the section below (Dagmar et al., 2007). Cryptography was first invented by Spartans (Djekic, 2013) in some 400BCE for transmitting data securely between

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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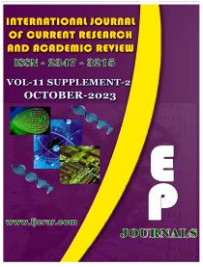

militants. They named their tool as scytale to encrypt their messages. Earlier times substitution method is used to encrypt the data. It replaces each letter of the plain text with another letter which is shifted with some fixed number between 0 and 25. The ciphertext can be decoded only if one knows the secret shift. For example, the string ''modern" will become ''oqftp" and can be decoded if one knows the secret shift is two. The message becomes more secure if the secret shift of each letter is different. For example, the string ''mod- ern" will become ''rqekut" having a secret shift ''421636". If the plain text is combined with some key with random values having the same keyword length as that of plaintext, we would call it a one-time pad and ensure the security of the message at that time.

Conclusions

Cybersecurity pertains to the practices that prevent cyberattacks, data breaches, and security threats. In general, the term cybersecurity is left with many questions such as what types of challenged and threats faced by organizations? How to mitigate those attacks? Who is at the highest risk? What steps need to be taken to reduce the cyber-attacks and risks? Still, many more questions are unanswered. This article describes the taxonomy of various existing standards for encryption and decryption of data with the recent emerging trends and the challenges faced by these standards in cybersecurity.

The commonly used security standards have been discussed with their strengths and weaknesses. In recent times, cybersecurity reached a new level, being transformed into a pre-eminence for digital business. However, some new approaches and methods are getting introduced based on the digital growth rate and on the other side, the hackers try new tools and technologies to challenge the security frameworks. Thenceforward, numerous other endeavors emanate. This paper provided a detailed review of the new advancements of the security standards of symmetric and asymmetric algorithms developed by various researchers over the period of time with the help of new algorithms, procedures, and frameworks. The RSA started with a one-way function along with a factoring problem. Adversely, instead of using a one-way function to secure the data, researchers instead of employing prime numbers develop an improved RSA algorithm with the help of ring integers to solve the factoring problems. The authors also proposed the technique of merging DES and RSA to achieve good confidentiality along with minimal overhead.

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International Journal of Current Research and Academic Review

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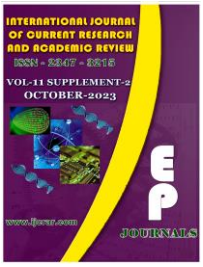

Likewise, all the other recent advancements of the RSA algorithm are well documented in this paper, the various key management schemes with their pros & cons are also discussed well.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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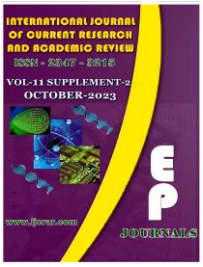

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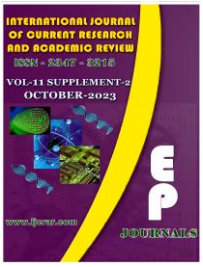

Full Length Article **IJCRAR/FL/92**

Optimization of growth conditions of Arabidopsis thaliana (L) Heynh in a controlled laboratory environment as a model plant organism

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Abstract

Arabidopsis thaliana, a member of Brassicaceae family, is a model plant suitable for transformation and molecular genetic studies. The plant has many advantages for genome analysis that include a short generation time, small size, large number of offspring, and a relatively small nuclear genome. Standardizing the growth conditions of this plant is an essential step in plant biotechnology labs. Hence the present study was focused on developing a standard protocol for growth in our lab.

Keywords: Model organism, Arabidopsis, plant genome, gene expression

Introduction

Model plant systems help to comprehend and extend insight about the genetic basis behind various plant process (1). Also, it is easier to design and perform genetic and genomic experiments using a model plant system. A. thaliana was initially chosen as the model plant system, and remains to this date, one of the most widely studied plant.

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International Journal of Current Research and Academic Review

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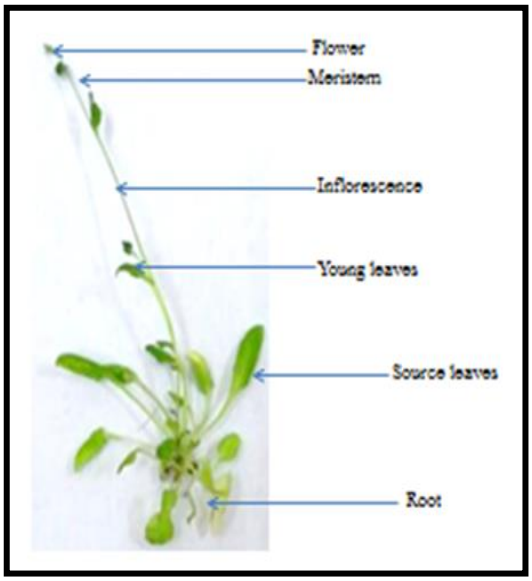
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Arabidopsis thaliana (Fig.1) is a model used to study plant genetics, molecular biology and biochemistry. This plant was first discovered by Johannes Thal in the sixteenth century and initially named "Pilosilla siliquosa", but since then it has gone through a number of name changes and is now widely known as Arabidopsis thaliana, or by the common name thale cress or mouse-ear cress [2]. The genus Arabidopsis has many species, but A. thaliana is the most commonly used in labs. This plant belongs to an agronomical important plant family- Brassicaceae (Cruciferae), though it does not have any agronomical importance in itself.

Arabidopsis is amenable to a wide range of experimental techniques, including genetic manipulation, mutant analysis, and various imaging methods. The versatility allows researchers to investigate diverse aspects of plant biology, from developmental processes to response to environmental stresses.

Figure 1: *Arabidopsis thaliana*



Scientific Classification of *Arabidopsis thaliana*

Kingdom	**Plantae**
Subkingdom	**Tracheobianta**
Division	**Magnoliophyta**
Class	**Magnoliopsida**
Subclass	**Dilliniidae**
Family	**Brassicaceae**
Genus	***Arabidopsis***
Species	***thaliana***

Arabidopsis has a 30,700 number of genes and its genome contains many classes of enzymes which is involved in secondary metabolism that are required for the synthesis of specialized

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International Journal of Current Research and Academic Review

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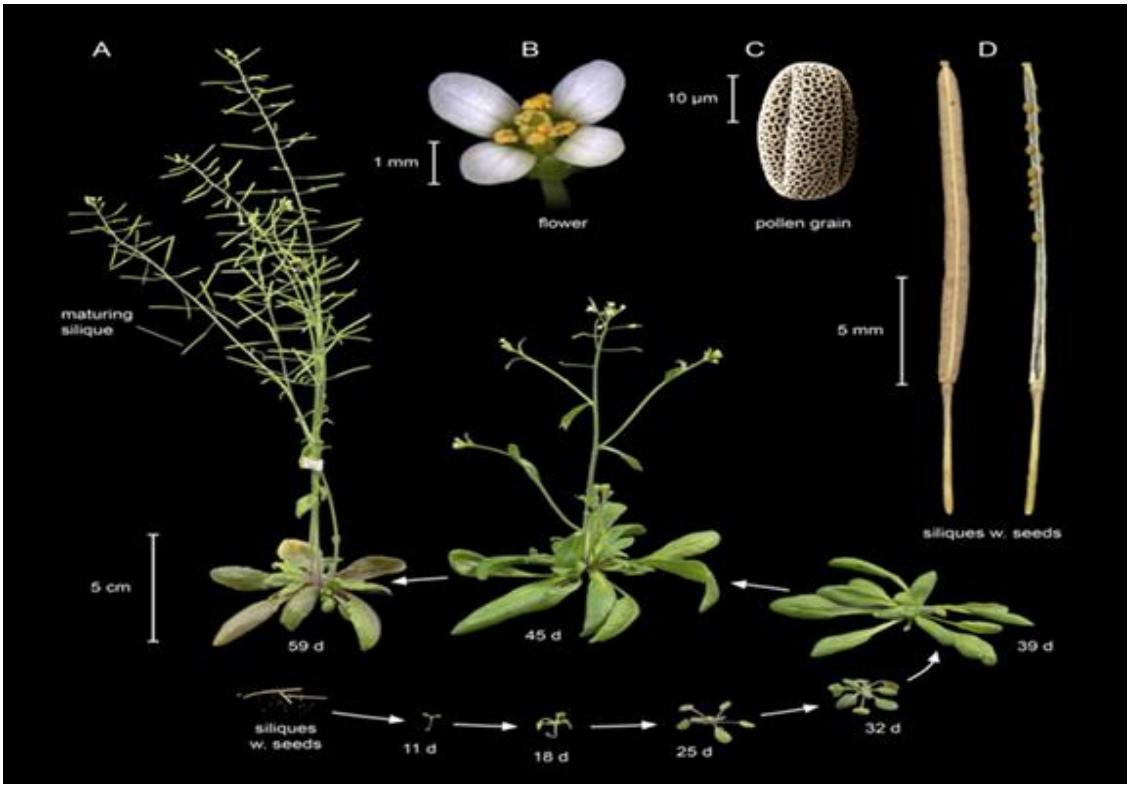
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

compounds. Arabidopsis contains around 1500 genes encoding in transcription factors that is approximately 5%. Arabidopsis thaliana useful for genetic mapping and sequencing with about 135 mega base pairs and 5 chromosomes, and it is having one of the smallest genomes among plants (3).

Figure.2 Lifecycle of Arabidopsis



(Image courtesy: https://doi.org/10.7554/eLife.06100.002) [4]

Arabidopsis develop from a seed into mature plant, in a short period of time as six weeks. Unlike many other plants, they can easily be grown indoors under feeble florescent lighting. Also, the seed and seedlings of Arabidopsis is small, allowing the germination of the plant in an adequate

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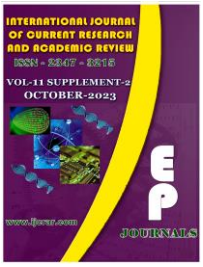

number even on a single petri dish [5]. As the growth of this plant, requires no coculture of other species, it increases the possibility of controlling different variables and helps in maintaining aseptic growth conditions. Thus, research using Arabidopsis is relatively convenient, fast, and cheap [6]. Also, the ability of the plant to undergo self-pollination and tolerate a high degree of homozygosity, makes it advantageous for research [7].Their simplicity in terms of morphology and growth requirements makes them accessible to researchers of various backgrounds and levels of expertise.

In this study we aimed to optimize the growth of Arabidopsisin vitro with different soil mixture and nutrients.

Materials and Method

Procurement of seeds

Wild-type A. thaliana (Col-0) seeds were provided by the NIPGR, New Delhi, India were used for initiation in pots.

Preparation of soil Mix

The soil mix contained river sand, vermiculite, activated charcoal and coco peat in theratio (2: 1:1:1) and was autoclaved to eliminate pests. The soil was packed loosely in paper cups with holes on a flat plastic tray. The soil was level to generate uniform and soft pack.The prepared pots were covered and stored at 4 ˚C, for 3 days to improve the rate of germination. This cold treatment is called stratification. The seeds were distributed evenly on the surface of the soil and was covered with clear perforated paper wraps and was left in dark for 2 to 3 days [8].

Maintenance of plants in growth rooms

Seeds were then surface sterilized using hypochlorite (1%) and then used for initiation on soil mix. The pots were placed in the dark for 3–4 days to allow seed germination. The pots were then transferred to the light racks, the plastic wraps were removed and seedlings were allowed to

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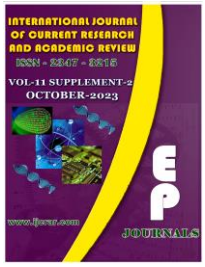

grow. The plantlets were grown at 21°C with 16 h light and 8 h of darkness cycle in a light rack [9].

Irrigation and nutrient solution

The soil was kept moist up to the 4-5 leaf stage, after which the soil was allowed to dry out periodically for the better growth of the plant and to avoid fungal gnats. After 4-5 leaf stages, the plants were irrigated with 0.1 M 1/2 (Half strength MS Media nutrient solution for about every two weeks [10].

Results

Growth of Arabidopsis

The soil mix contained river sand, vermiculite, activated charcoal and coco peat in theratio (2: 1:1:1) and was autoclaved to eliminate pests. The soil was packed loosely in paper cups with holes on the sides and placed on tray. The prepared pots were covered and stored at 4 ^{o}C for 3 days to improve the rate of germination. This cold treatment is called Stratification. The seeds were distributed evenly on the surface of the soil and were covered with clear perforated paper wraps and was left in dark for 2 to 3 days. The pots were then transferred to the growth area. The wraps were removed and were left until germinated seedlings were visible. The pots were then transferred to the growth rooms.Arabidopsis seeds need high humidity to germinate efficiently, so the cups were covered with humidity domes until seeds germinate and start turning green, which takes about five to six days [11]. Plants were watered properly as too much water or too little water can adversely affect plant growth. Too much water can lead to the appearance of white mold on the soil, which can infect the plants. Too little water can lead to drought stress. Therefore, proper watering of plant was done at regular intervals. At approximately four-five weeks, flowering of the plants was observed (Fig. 6 D).

The germinated seedlings were immediately placed under illumination rack, with 16 hr of light and 8 hr of darkness. The pots were watered regularly and all the pots were covered with perforated clear plastic covers. Maintenance of soil moisture is imperative for successful

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germination of the seeds as well as proper growth of the seedlings. In addition to water, the seedlings were nourished with ½ strength MS solution and the different stages of the plant growth was monitored for the development of rosette formation, appearance of inflorescence, silique formation, and seeds[12].

Figure 3: A- seeds of Arabidopsis thaliana. B- Seed initiation in soil mix

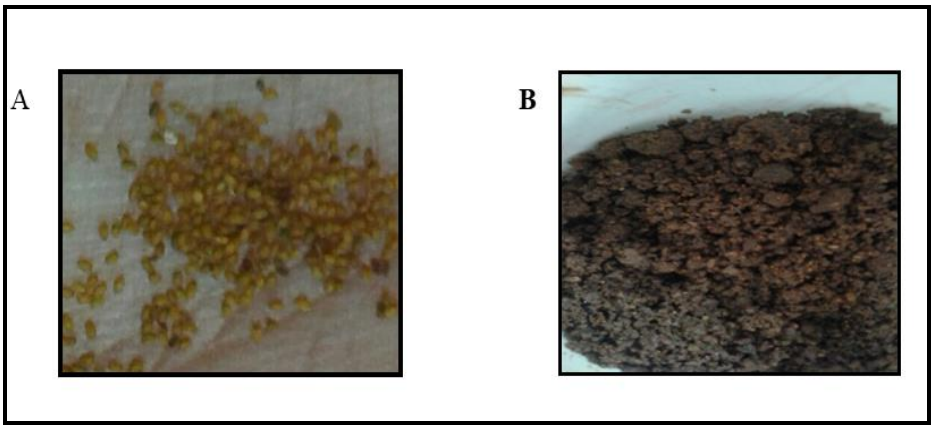

Figure 4: Different stages of seed germination

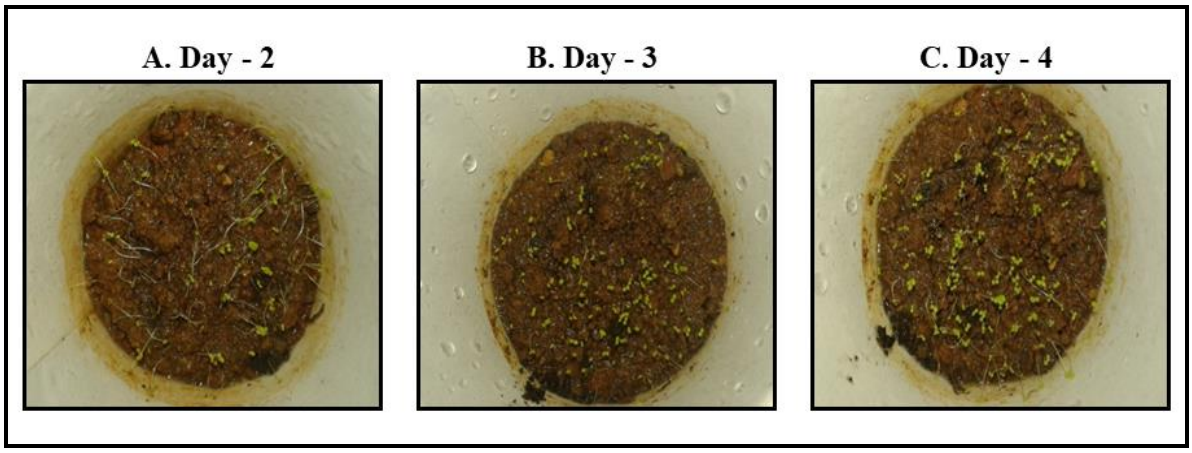

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Figure 5: A- 4-5 leaf stage. B- Rossette formation. C- Inflorescence. D- Flowering

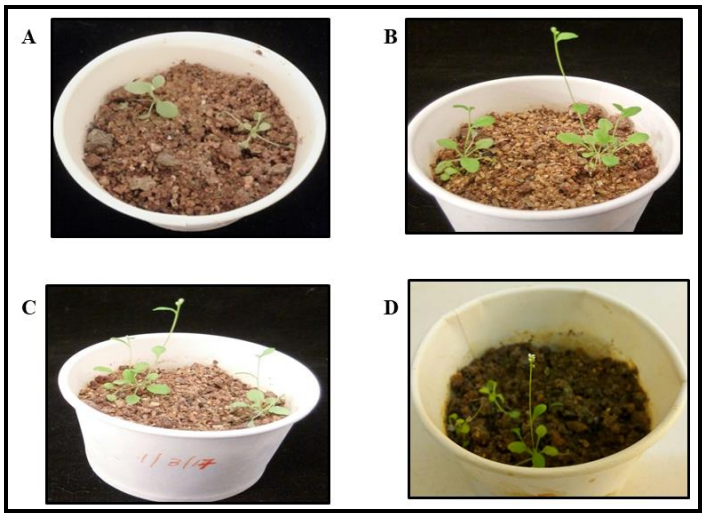
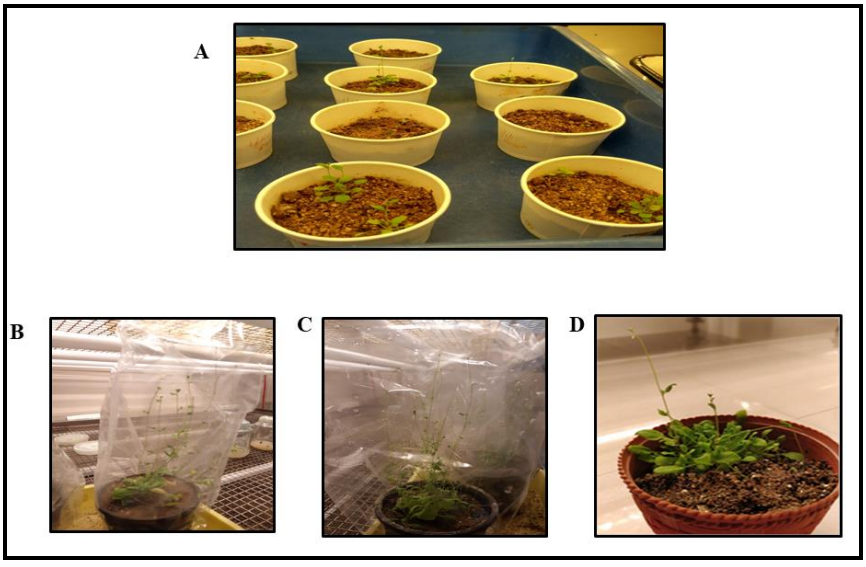


Figure 6: A- Arrangement of Arabidopsis Plantlets on a tray. B&C Plants inside moist covers. D. Acclimatization of Arabidopsis.



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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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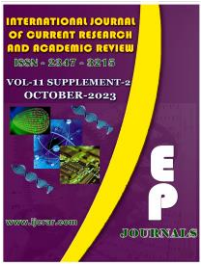

As plants mature, they needed less water, but watering was continued while seeds were setting. The seeds were collected as soon as the siliques were broken with little or no applied pressure. The collected seeds were left in microfuge tubes at room temperature for approximately one week and can be planted whenever needed [13].

Discussion

In this study, we investigated the growth and development of Arabidopsis thaliana under controlled laboratory conditions. Our research aimed to shed light on the responses of this model plant species to specific growth conditions, genetic manipulations, and mutants. Here, we discuss the key findings, their implications, limitations, and potential future directions.The growth conditions established in our laboratory closely mirrored the natural habitat of Arabidopsis, with carefully controlled parameters such as light intensity, photoperiod, temperature, humidity, and nutrient composition. As expected, these conditions had a profound impact on the phenotype of Arabidopsis plants. We observed that under the specified conditions, Arabidopsis exhibited vigorous growth, with healthy leaves, well-developed stems, and a predictable flowering time. These observations align well with various studies conducted previously [14, 15].

Conclusions

In conclusion, our study provides valuable insights into the growth and development of Arabidopsis thaliana in a laboratory setting. We observed that growth conditions, photoperiod, and genetic manipulations play pivotal roles in shaping the phenotype of Arabidopsis. However, Future research could explore the molecular mechanisms underlying the observed phenotypic changes in transgenic Arabidopsis lines.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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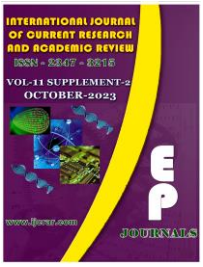

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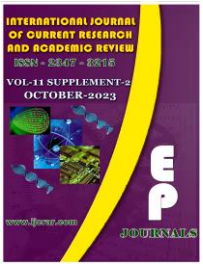

Full Length Article **IJCRAR/FL/93**

Machine Learning Methodology for Cotton Crop Leaf Disease Detection and Classification

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Abstract

The standard method of disease identification and detection for agricultural leaf diseases carries a higher probability of failure, and delays in disease diagnosis cause farmers to suffer significant losses. There are various varieties of leaf disease; some may show symptoms at an early stage and others may do so later on or at the time of harvest, which could have an impact on both the yield and the production. Detecting and identifying crop diseases have been made easier with help of machine learning and its various algorithms. To achieve its disease detection objectives, the methodology uses techniques including image processing, segmentation, and classification as their back end. The methodology used for crop disease detection using machine learning algorithm is also represented in this paper in order to increase efficiency and success. This study represents many strategies and algorithms that are employed to identify crop leaf disease and infection in order to achieve maximum success.

Keywords: Machine Learning, image processing, Cotton Crop Leaf Disease Recognition System (CCLDRS).

Introduction

India is a country of villages, and agriculture, which is the foundation of the country's economy, provides the majority of the world's food. Due to India's reliance on the yield, quality, and volume of its crop production, it has a significant impact on the Indian economy. Crops are

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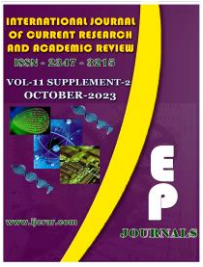

susceptible to a number of diseases, with symptoms frequently showing up on the leaf, fruit, and stem [1]. The early detection of diseases is crucial for reducing the use of pesticides, but most farmers still rely on the time-consuming and often inaccurate traditional method of relying on the advice of a senior person to identify diseases based on visual effects on leaves. Continuous monitoring of large farms is very challenging when using such a manual and old-fashioned disease detection technology. Plant leaf diseases can be quickly identified and categorized by using image processing techniques [2] [3].

Image Processing as a catalyst for Disease Detection

Crop leaf disease recognition involves various image preprocessing and processing fundamentals in order to recognize and distinguish crop leaf diseases. Acquisition of image, pre-processing of image, segmentation of image, feature extraction of image, and leaf disease detection are among the steps.

Crop leaf disease detection includes some image processing basic step to detect and classify the crop leaf diseases. The steps include Acquisition of image, pre-processing of image, segmentation of image, feature extraction of image, and leaf disease detection. These steps are as follows:

Image Acquisition

The first step in image processing is image acquisition. Image acquisition is the first stage in any vision scheme. High-resolution cameras are used to collect and record the crop/plant leaf. Photos can also be taken from a number of sources, such as public databases, the internet, or directly from the fields. Image quality is measured by image resolution as well as the parameters of RGB (Red, Green, and Blue) values.

Image Pre-Processing

The second step in image processing is image pre-processing. Image enhancement, RGB transformations, filtration, and other steps are all part of the pre-processing process. The image enhancement can be accomplished by increasing the contrast. Filtering techniques are then used

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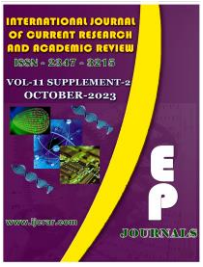

to smooth out the image. Filtering strategies include median, average, and Gaussian filters, among others.

Image Segmentation

The third step in image processing is Image Segmentation. The term "segmentation" refers to the division of an image into many parts with the same or similar features. Segmentation can be achieved using a variety of methods, including the otsu process, converting RGB images to HIS models, and k-means clustering, among others. The objects are categorized into K number of classes based on a collection of features using K-Means clustering objects. The classification of the object

Feature Extraction

The fourth step in image processing is Feature Extraction. The extraction of features from an image is critical for object recognition. The affected or diseased part of the image is removed after image segmentation. Color, texture, form, edges, and morphology are the attributes and that can be used in plant leaf disease detection in a variety of applications of image processing. Various techniques, such as Color moments, Color histogram, and Color structure descriptor, are used to extract color characteristics. The Grey Level Co-occurrence Matrix (GLCM) approach is used to remove texture characteristics.

Classification and Detection

The last and final step in image processing is Classification and Detection. Several classifiers are used for working on data set training and testing. Support vector machines (SVM), k-nearest neighbor, neural networks, fuzzy logic, and other classifiers are examples. Leaf diseases are categorized and detected using these methods [4].

Machine learning

The technique of teaching computer and machines how to manage data more efficiently & effectively is known as machine learning. Many times it may be not possible to interpret the

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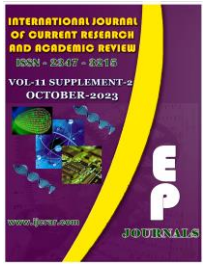
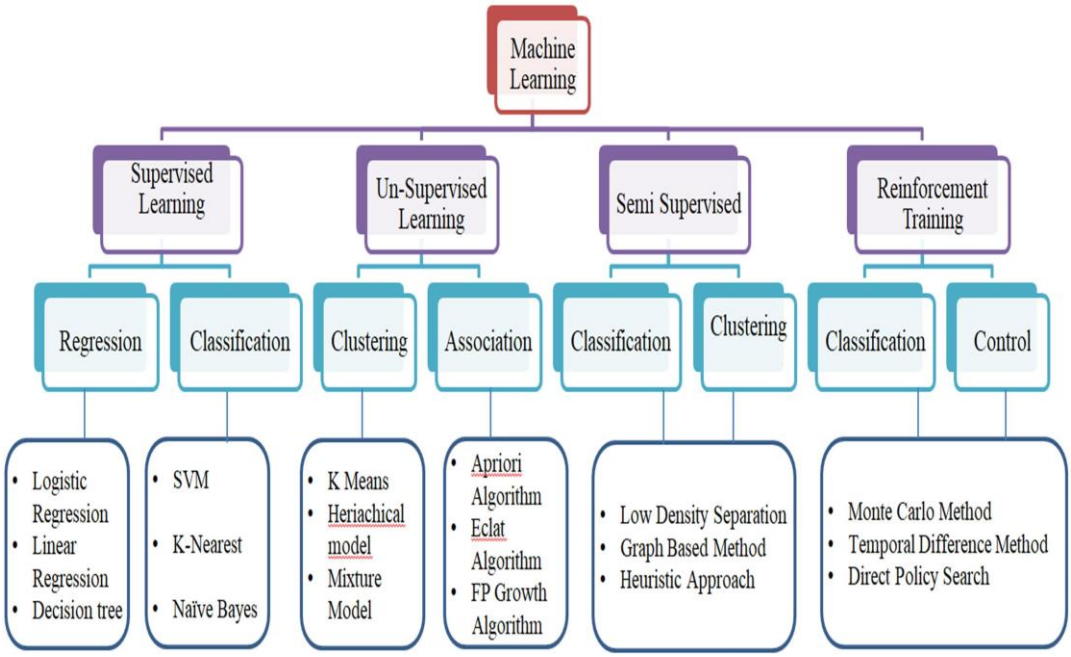


pattern or also extract information from the data after viewing it. In such cases, machine learning is used. Machine learning is becoming more common as more data sets become available. Machine learning is used in a number of fields, from medicine to the military, to extract relevant data. The goal of machine learning is to gain knowledge from data. There have been many experiments on how to teach computers to learn on their own. To solve this problem, many mathematicians and programmers use a variety of approaches. Some of them are seen in the illustration below [5].

Fig.1 Machine Learning and its types



Supervised Learning

Algorithms that need external assistance are known as supervised machine learning algorithms. The training and research data sets are isolated from the input data set. The output variable in the train data set needs to be estimated or categorized. For prediction or classification, all algorithms

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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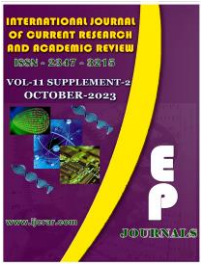

learn patterns from the training data set and apply them to the test data set [5]. The supervised machine learning algorithms are those algorithms which needs external assistance. The input data set is divided into train and test data set. The train data set has output variable which needs to be predicted or classified. All algorithms learn some kind of patterns from the training data set and apply them to the test data set for prediction or classification [5]. Three most famous supervised machine learning algorithms have been discussed here.

Decision Tree

Decision trees are trees that group attributes by sorting them according to their values. The decision tree is primarily used for classification. Nodes and branches make up each tree. Each branch represents a value that the node can take, and each node represents attributes in a category that needs to be categorized [5].

Naive Bayes

The text classification industry is the primary focus of Naive Bayes. It is primarily employed for the purposes of clustering and classification [6]. The conditional probability is used in the underlying architecture of Naive Bayes. It creates trees based on the likelihood of them occurring. Bayesian Network is another name for these trees.

Support Vector Machine

Support Vector Machine is another common state-of-the-art machine learning technique (SVM).

It's mostly used for categorization. SVM is based on the concept of estimating margins. Basically, it is used to draw lines between groups. The margins are drawn such that the difference between the margin and the classes is as small as possible, reducing the classification error.

Unsupervised Learning

The data is used only to learn a few features by the unsupervised learning algorithms. When new data is added, it recognizes the data's class using previously learned features. It's also used for feature reduction and clustering.

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K-Means Clustering

Clustering, also known as grouping is an unsupervised learning strategy that generates groups on its own. Objects with common characteristics are grouped together in a cluster. Since it produces k distinct clusters, this algorithm is called k-means. The center of a cluster is the mean of the values in that cluster.

Principal Component Analysis

The dimension of the data is reduced in Principal Component Analysis, or PCA, to make computations quicker and easier. Have a look at an example of 2D data to see how PCA operates. When plotted in a graph, the data can take up two axes. When PCA is applied to the data, the data becomes one-dimensional.

Semi - Supervised Learning

Semi-supervised learning algorithms incorporate the benefits of both supervised and unsupervised learning techniques. It can be useful in areas of machine learning and data mining where there is already un-labeled data and getting the classified data is a time-consuming process [5].

Crop Leaf Disease Classification

Bacterial Disease Symptoms

"Bacterial leaf spot" is the most common name for the disease. Tiny, yellow green lesions on young leaves, which are normally deformed and twisted, or dark, water-soaked, greasy-appearing lesions on older foliage, are the first signs.

Viral Disease Symptoms

All virus diseases cause a reduction in yield, and virus-infected plants have a limited lifespan. Viruses can affect the different parts of crops like root, stem, leaves and fruit as well. Most

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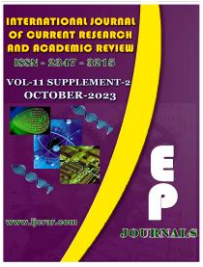

recordable symptoms on crops infected by virus are those which appear on leaves. It is very difficult to diagnose a viral infection. Leaves appear wrinkled and twisted, and development may be slowed due to the virus [6].

Fungal

It's a type of plant pathogen that causes some of the most dangerous plant diseases. Fungi are responsible for the majority of vegetable diseases. Plants are harmed because they destroy cells.

Infected seed, soil, crops, and weeds are the major sources of fungal disease. Wind and water, as well as the movement of polluted soil, livestock, workers, equipment, and tools, disperse it.

It firstly appears as water-soaked gray-green spots on lower or older leaves. These spots darken over time, and white fungal growth occurs on the undersides. A yellow to white streak appears on the upper surfaces of older leaves when downy mildew is present. On the undersides, white to grey fungal growth surrounds these areas. Water-soaked lesions are found in leaf-late blight. It started as a small brown or black spot on the undersides of the leaves and later spread throughout the area. *Alternaria solani* causes early blight, which is a fungal disease. It appeared on the lower side of older leaves as small brown spots with concentric circles that formed a bull's eye pattern in the beginning. As the disease rate rises, it opens out on the surface of the leaf, giving rise to become infected. It started as a small brown or black spot on the undersides of the leaves and later spread throughout the area. *Alternaria solani* causes early blight, which is a fungal disease. It appeared on the lower side of older leaves as small brown spots with concentric circles that formed a bull's eye pattern in the beginning. As the disease rate rises, it spreads outward on the leaf surface, causing it to become infected [6].

Proposed Cotton Crop Leaf Disease Recognition System (CCLDRS)

Steps

1) Image Acquisition can be done Using Red Green Blue
2) Pre- Processing of Image can be done from RGB to HSV Color Transformation

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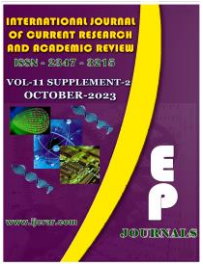

3) K-Means is used for Segmentation of Image
4) Grey Level Co-occurrence Matrix (GLCM) is used for feature extraction
5) Support vector machine is used for classification

RGB Image acquisition

The acquisition of the image is the first step in image processing. We obtain the image using a data set of 60 images, 35 of which are diseased cotton images and 25 of which are regular cotton images obtained from various farms.

Image pre-processing

Following image acquisition, image pre-processing is performed in order to improve image quality and eliminate any unnecessary distortions. The picture is clipped to get the desired region of the cotton leaf. The aim of image enhancement is to improve the image's contrast. The Hue-Saturation-Value (HSV) image is formed from the Red Green Blue image.

Image segmentation

The pixels that are green are masked. The picture is clustered using K-Means clustering. The classification into K number of classes is done using K-Means clustering, which is based on objects and a collection of features. The number of squares of distances between the corresponding clusters is minimized when classifying an object.

Feature Extraction

For feature extraction with four features, GLCM is used. The features like energy, homogeneity, contrast and correlation.

Classification

The useful segments are obtained to classify the leaf diseases. Segment the components using genetic algorithm Classification is based on the Support Vector Machine (SVM) algorithm

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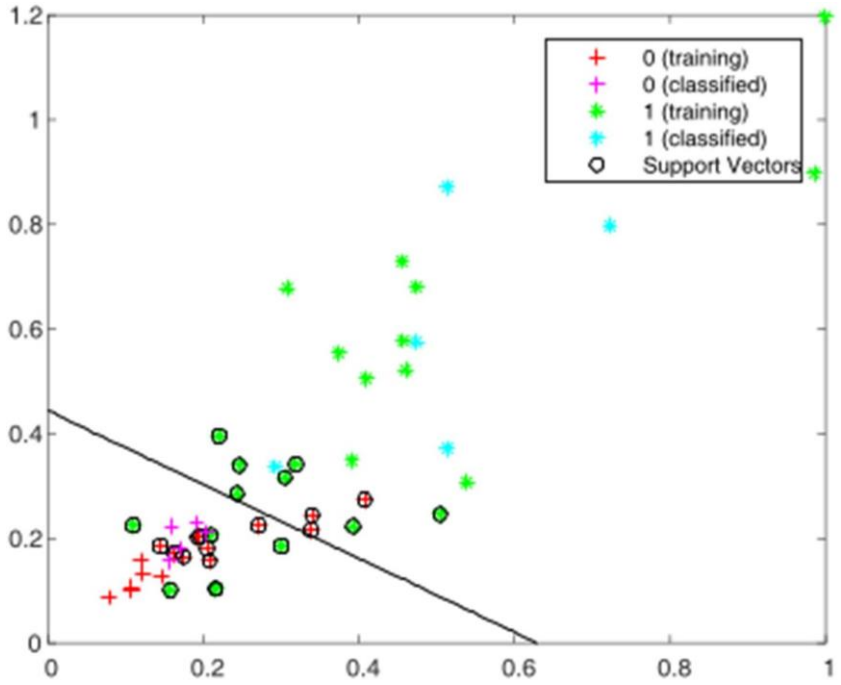
Results

To begin, a data set of 60 cotton leaves with 35 diseased leaves and 25 healthy leaves is produced. The RGB colored input images are translated to HSV color space and segmented using the SVM algorithm. A total of three clusters have been chosen. The segmented images and the sample input images.

With the aid of diseased leaves segmentation, the diseased portion of the leaves was established. The images were resized to 256 x 256 pixels and converted to gray scale. For each image in the data set, the Contrast Correlation Homogeneity and Energy features of the GLCM texture were extracted and processed. The SVM classifier was given all four vector features of database images as input.

Fig.2 Support Vector Machine



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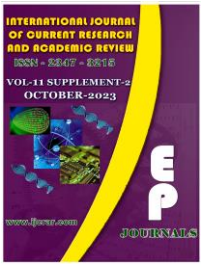

Table.1 Classification Results

Table 1- Classifier Performance

Diseased leaves	Normal leaves	Minimum Classification Accuracy
35	25	0.90

Conclusion

Cotton leaf disease identification was implemented. The features of the GLCM were extracted, and SVM was used to identify cotton leaf diseases. The Crop Leaf Disease Recognition System (CLDRS) model of disease detection was used to detect disease. Different classification models may be used in the future to improve classification accuracy.

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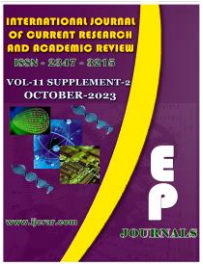

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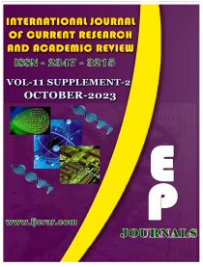

Full Length Article **IJCRAR/FL/94**

A Study of Rural Purchasers' Satisfaction and their Awareness towards Telecom (Wireless) Service

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Abstract

Objectivity of the research paper, stain of 2G spectrum and the waves of 3G, 4G and 5G have anxious the Telecom Industry and there is a lot more preparing. The post liberalization period witnesses the unprecedented growth in telecom industry and a significant rise in telecommunication density in India due to the wide spread of cellular network and internet technology. The development of rural area is possible through telecom sector as the growth of telecom and development of infrastructure are directly related. The affordability of telecom service leads to increase in telecommunication density in rural areas. As telecom industry is competitive, it becomes imperative for wireless telecom service providers to offer quality services to customers and develop long term relationship. The primary objectives of this research study are to study the rural consumer satisfaction and to understand their perception towards telecom service. The researchers have collected necessary data from 100 rural customers availing wireless telecom services over questionnaire for which a suitable sampling method was used. Moreover, the present status of telecommunication density in rural area is documented with the help of secondary data. Multiple Regression Analysis and descriptive statistics such as mean score and standard deviation have been used as statistical tools. The findings indicate that customer care service and value added service have the significant impact on customer satisfaction towards telecom services in rural areas. In addition to this, the result shows that majority of respondents are Idea subscribers in rural areas and 35% of rural consumers are highly satisfied while 44% of respondents agreed that call and SMS plans are consumer friendly.

Keywords: Telecom, tele-density, Purchaser happiness, Mobile network.

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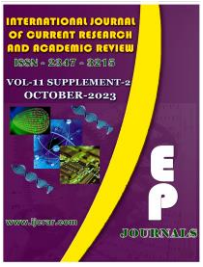

Introduction

The phenomenal growth of telecom industry can lead to the accomplishment of objective of a nation such as Digital India, Infrastructure development and improvement in rural lifestyle etc. The ultimate reason is that the industry is greatly influenced by wide spread of cellular network and internet technology. The tele-density is on rising due to Government's telecom policies and regulatory framework of TRAI. Similarly, the emergence of wireless telecom service and liberalization has brought significant revolution in the industry. Actually, the growth of telecom industry largely relies on the development of necessary infra- structure consequently the rapid growth of a developing country. In India, telecom industry is facing competition because of the existence of number of private cellular companies and their basic and value added services (VAS).

Table.1 Total Subscribers in India various wireless Network

Wireless Telecom Operator	Share Market value %
Jio	57
Airtel	21
Vodafone	19
BSNL	8
Aircel	7
Rail wire	31
Act	27
Tata	5
Sistema	1
Other	4

The above table clearly depicts wireless market share in terms of total subscribers in India. As shown above, Bharti Airtel has a larger market share (21%) followed by Vodafone (19%). The market shares held by Idea, Reliance, BSNL and Aircel are 19%, 8%, 7% & 31% respectively. Moreover, the shares of urban subscribers and rural subscribers at the end of October 2014 were 59.27% and 40.73% respectively. And the wireless subscription in urban area increased from 547.70 million at the end of September 2014 to 548.78 million at the end of October 2014. The wireless subscription in rural areas increased from 382.50 million to 386.57 million during the

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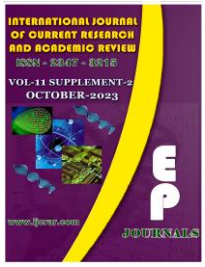

same period. The monthly growth rates of urban and rural wireless subscription were 0.20% and 1.06% respectively. According to a report of Telecom Regulatory Authority of India (TRAI), the total, urban and rural teledensity as of March 31, 2020 were 75.2%, 145.8% and 44% respectively which shows the significant growth over the last 15 years. 'Today, the Indian telecom industry suffers from major problems of customer attrition in the name of "number portability" because of multiple service providers or close substitutes with zero or less switching cost.

Table.2 Total Telephone Subscription in India

Type of Subscription	Percentage of Subscription
Rural Wireless	71
Urban Wireless	58
Urban Wire line	24
Rural Wireline	41

Above statistics give the correct picture of total % of subscription in both urban and rural market. Total share of wireless subscription in urban and rural areas are 71% and 58% respectively, while total share of wire line subscription are reported 41% and 24%.

Table.3 Total Service Provider in Rural Subscriber

Service Provider	No.of.Subscribers	No.of.Rural Subscribers	% Subscribers	Market Share of rural subscribers
Jio	235	115	56.7	26.7
Airtel	176	94	33.65	28.9
Vodafone	190	93	31.3	14.5
BSNL	76	73	21.4	12
Aircel	81	30	24.3	10
Rail wire	70	46	38.5	8
Act	65	37	33.56	-
Tata	31	21	31.34	-
Sistema	21	17	18.33	-
Other	2	4	7	-

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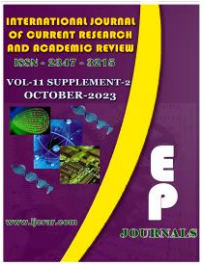

As on 30th June 2020, there were total 947 million subscribers, out of which 530 million were rural subscribers. Moreover, there were 295.88 million wireless subscribers out of which 471.85 million were rural subscribers and rural density was 98. Total internet subscribers were 279.5 million out of which 114.44 million are rural Internet subscribers and rural internet density was 13.17.

Literature Survey

(Sharma, 2014), investigated variety of factors which influence customer satisfaction. The findings showed that customers are more satisfied with quality of service network coverage, quality of SMS and mobile internet. The results also indicate the significant relationship between customer satisfaction and the age, occupation and education level of customers, but no significant relation was reported between customer satisfaction and the monthly income. Similarly, (Yadav and Dabhade, 2013), attempted to know the impact of service quality on customer satisfaction among mobile users by using SERQUAL model. They found that customers remain content with the availability of VAS (value added service) and good network coverage and suggested that service providers are required to carry out marketing research to know the customer satisfaction. (Umair, Saeed, Arshad, Haider, & Ahmad, 2013), used structural model to analyse the relationship between customer loyalty and service quality, customer satisfaction, brand image, product value. The results reveal that customer loyalty has a direct and positive relationship with customer satisfaction, quality and value and no significant relationship was found with perceived brand image. (Ratnesh & Kansal, 2013), found that customer satisfaction with caller tune services of mobile service providers is not significantly related to the occupation of consumers, whereas significant relationship was resulted between customer satisfaction with call rates of mobile service providers and income of consumers and between that of with availability of customer stores and age of consumers. In their research, they recommended customised VAS, convenience, network coverage and call tariff. (Dineshkumar & Moorthy), conducted a research aimed to know the satisfaction level of customers with service provided by Airtel prepaid and determine their preference. (Naidu & Ponduri, 2015) attempted to study Customer Relationship Management practices followed by the major public (BSNL) and private (Airtel) sector telecom service providers in India and concluded that BSNL has improved a lot in its performance and quality of service after the emergence of private players in terms of uninterrupted services, customer satisfaction, retention and providing customized products.

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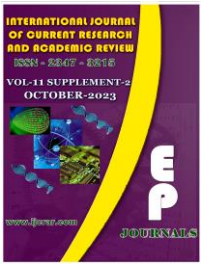

Importance Study

Now, the telecom industry has become the most competitive and so, it is an alarm for the service providers to revamp their marketing strategy to offer customers satisfaction and to capture the larger market share. Telecom services providers are required to concentrate more on rural areas as majority of customers reside there. This study offers an insight on rural consumers' perceptions and satisfaction towards telecom service.

Table.4 Primary data compiled by the authors

S.No	Details of Respondent		Percentage of Respondent
1	Gender	Male	86
		Female	64
2	Age Group	18-24	96
		25-30	57
		31-45	64
		Above 45	44
3	Education	SSLC	70
		HSC	46
		DEGREE	34
4	Occupation	Student	86
		House Wife	12
		Business	40
		Self Employed	12

Statement of Problem

There is a lot more brewing in Telecom Industry. Broadly speaking, net neutrality, black stain of 2G spectrum and waves of 3G and 4G have rattled the entire telecom industry and therefore the Government and TRAI have raised the eyebrow over the phenomenal growth in the industry. Today, telecom industry has gained the status of most competitive in nature with the existence of

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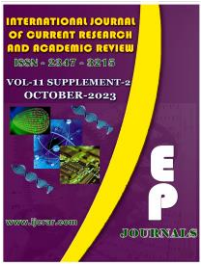

public and private players and the access of telecom (wireless) service in rural area is no longer any dream because of its affordability and availability which has resulted into rise in teledensity in rural area.

However, yet lower rural tele-density has been reported as compared to urban area. Through this study, the researchers are striving to give an account on rural teledensity and rural consumer satisfaction and their perceptions towards telecom service especially wireless.

Research Objectives

- To study the impact of Value Added Service, Customer Care Service and Commercial aspects of telecom service on Customer Satisfaction
- To understand rural consumer's perception towards telecom service
- To analyze the present trend of wireless subscription and tele-density in rural area.

Research Hypothesis

Ho1: There is no significant impact of Commercial Aspects on Customer Satisfaction towards telecom service in rural areas.

Ho2: There is no significant impact of VAS on Customer Satisfaction towards telecom service in rural areas.

Ho3: There is no significant impact of Customer Care Service on Customer Satisfaction towards telecom service in rural areas.

Results and Discussion

To successfully realize the aforementioned objectives, following research methodology was used by the researcher. All rural consumers availing wireless telecom service of Kheda district were considered as the universe of the study. The researchers have collected relevant data from 106

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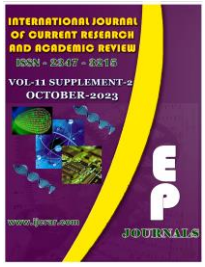

rural consumers availing telecom service. A convenient sampling method was adopted to collect the data. A structured questionnaire with 5 points rating Likert Scale was used to collect the primary data. The researchers have distributed 130 questionnaires, out of which 117 were received back and 11 questionnaires were found to be incomplete.

Hence, 106 questionnaires were fit for the research. Multiple Regression Analysis and Descriptive Statistic such as Mean and S.D were used as statistical tools. To furnish more information on tele-density in rural area and related research done in the similar area, the researchers reviewed some secondary sources like books, magazines, journals and other published information.

Table.5 Type of Mobile User

S.No.	Types of Mobile	No.of.Mobile User
1	Basic Model	23%
2	Android App	77%
	Total	100%

The Table 5 shows that 23% of respondents have simple mobile phone while majority of respondents (77%) possess Android App. This statistic makes it clear that affordability and popularly of Android App in rural areas

Table.6 Type of Account

S.No	Types of Mobile	No.of.Mobile User
1	Post Paid	6%
2	Pre-Paid	74%
	Total	100%

As shown in the table 6, 96.23% of rural consumers have prepaid account whereas only 3.77% of rural consumers have post-paid account.

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Table.7 Frequency Loss of Services

S.No	Frequency Loss of Services	No.of.User
1	Never	10(9.43)
2	Once	10(9.43)
3	Rarely	14 (13.21)
4	Often	7 (6.60)
5	Some times	65
6	Total	106

The above statistics make it clear that 9.43% of respondents have reported the 'Never' loss of service, 9.43 % of respondents shared 'Once' loss of service, 13.21% of respondents have reported 'Rarely' loss of service, 6.60% of respondents experienced 'Often' loss of experience while majority of respondents (65%) have opined 'Sometimes' loss of service.

Table.8 Internet Usage using Mobile

S.No	Internet User in Mobile	No.of.User
1	User	87 (83.53)
2	Non-User	23(16.47)
	Total	100

The above table gives an account of the access of internet facility through mobile. As per the given data, 83.53% of respondents have access of internet through their mobile whereas only 16.47% do not avail internet facility in their mobile. Moreover, Appendix II offers the bird view of rural consumers' perception toward telecom services, 35% of respondents are highly satisfied whereas 33% are just satisfied. Moreover, Majority of respondents (55%) opined that they enjoy availing service and 35% agreed that they will not switch over to other operators. Similarly, 39% of rural respondents strongly believed that staffs are courteous, polite and well behaved, 34% of respondents agreed that there is availability of customer care offices. In the similar line, 43% of respondents agreed that technical support and problem assistant are taken care of. Surprisingly, 55% of rural consumers strongly agreed for 24 x 7 hours' customer care service.

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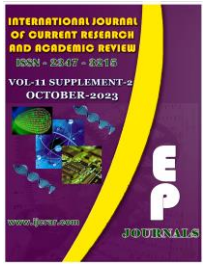

Table.9 Descriptive Statistics and Reliability

S.No	Variable	No.of.Items	Mean	S.D	Cron bach's Alpha
1	Commercial Aspects	06	3.0987	0.69634	0.583*
2	Value Added Service	12	3.0683	0.44106	0.621
3	Customer Care Services	07	3.7481	0.69964	0.675
4	Customer Satisfaction	05	3.8113	0.74853	0.700

The reliability and internal consistency of the items representing each construct were evaluated using Cronbach's alpha. The reliability statistics for independent and dependent variables given in the table 9 show that the values of variables range between 0.583 and 0.700. There is a general consensus among the researchers that the acceptable alpha limit could be as low as 0.621 or 0.583* for scales consisting of a small number of items (Carmines & Zeller, 1979; Cronbach & Meehl, 1955; Pedhazur & Schmelkin, 1991). Hence, the reliability and internal consistency values of the measures are accepted.

Table.10 ANOVA

Model	Sum of Squares	Df	Maen Square	F	Sig
Regression	13.896	3	4.965	10.684	.000
Residual	43.879	102	.430		
Total	57.775	105			

The ANOVA table shows that overall model is significant as the p sig. value (0.000) is less than 0.05. So, the model is statistically significant and fit.

Finding, Recommendations and Managerial Implication

Looking at present trend in telecom sector, all telecom companies are required to formulate such benefit offering strategies as can retain the customers for long time and be capable of fetching

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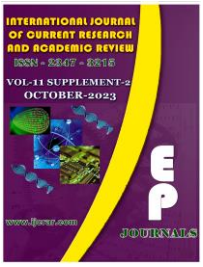

more number of new customers. Similarly, telecom service providers should adopt customer oriented approach instead of product oriented. To a larger extent, consumer friendly approach in service sector especially telecom adds value to the customer satisfaction. Most importantly, rural consumers often complain about the loss of connectivity or service which may negatively influence their perceptions and satisfaction. To capture larger market share, service providers need to develop necessary infrastructure suited to wireless telecom service and make available customer care offices at particular destination in rural areas. Besides, receipt of junk stuff such as unwanted SMS and unsolicited call develop feeling of irritation among the consumers which in turn switching to other service providers. It is also recommended that telecom service providers should think of such variety of promotion offers as can satisfy the diversified needs of rural consumers. Today, highest attrition rate is observed in telecom industry and therefore, service providers should revamp the marketing strategy which is aggressive in nature and more attention should be paid on quality of service. To wisely deal with rural consumers and to persuade them, staffs should be well trained, courteous, polite and well mannered.

Conclusion

In a nutshell, tele-density of wireless telecom subscription in rural areas is yet lesser than that of in urban areas. And factors like customer care services, fair charges of SMS and call, non-receipt of spam SMS and unsolicited calls, courteous and polite staff contribute significantly to customer satisfaction.

Limitations of the Study

The study is confined to only few selected rural areas of Thiruvannamali district and therefore, the result cannot be generalized. Moreover, the research involves small sample size. Hence, the same study can be conducted with large sample size and in the context of other rural areas.

Scope for Further Research

Similar study can also be carried out in rural areas by taking other services such as healthcare, education, insurance, banking etc.

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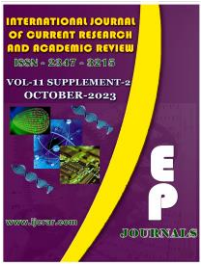

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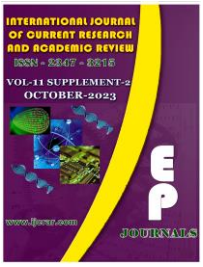

Full Length Article **IJCRAR/FL/95**

A Systematic Study of Data Wrangling in Machine Learning

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Abstract

These days almost anything can be a valuable source of information. The primary challenge lies in extracting the insights from the said information and making sense of it, which is the point of Big Data. However, you also need to prep the data at first, and that is Data Wrangling in a nutshell. The nature of the information is that it requires a certain kind of organization to be adequately assessed. This process requires a crystal clear understanding of which operations need what sort of data. This calls for a self-service approach of data analysis that is more inclusive. With the help of data wrangling tools and a self-service approach, analysts can work with more complex data more rapidly, provide more precise results, and make better decisions.

Keywords: Big Data, Data Wrangling, Decision Making, Data Analysis.

Introduction

Data Wrangling

Data wrangling, also known as data munging, is the act of organizing sets of data from many sources into a single coherent whole for subsequent processing. It involves changing data from its original "raw" form into a more consumable shape.

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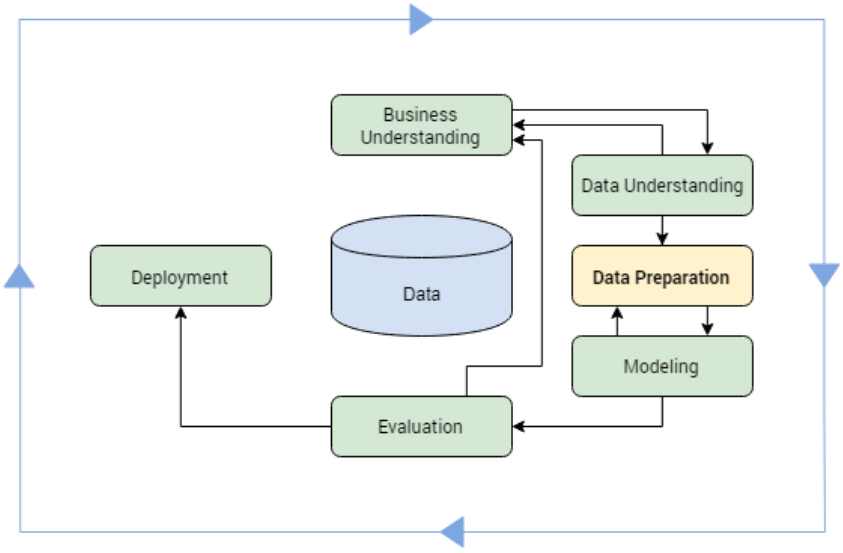
Fig.1



For defining "raw data" as Any repository data (texts, photos, or database records) that has not yet been fully processed and incorporated into the system is considered to be in this category.

The term "data wrangling techniques" refers to the act of "digesting" (also referred to as "munging") data and making it useful (also known as "usable") for the system. It can be thought of as a stage in the preparation process for all other data-related operations.
Mapping is frequently done in conjunction with data wrangling. The step of the data wrangling process that involves matching up source data fields with their corresponding destination data fields is referred to as "Data Mapping." Data transformation is the focus of Wrangling, whereas connecting the dots between various parts is the goal of mapping.

Objective of Data Wrangling

Getting data in a cohesive shape might be characterized as the main goal of data wrangling. In other words, it makes unprocessed data useful. It offers the foundation for additional actions.

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Data Wrangling serves as a stage in the data mining process' preparation as a result. These two operations are linked together in terms of processes since they depend on one another. Overall, the following procedures are included in data wrangling:

- assembling data from numerous sources in one location
- putting the data together based on the chosen setting
- clearing the data of noise or incorrect or missing components

It should be emphasized that Data Wrangling requires a fair amount of computational power and time, as well as human resources. Over half of what a data scientist does is spent manipulating data. The positive side of this is that well-done data wrangling creates a strong basis for additional data processing.

Data Wrangling Steps

Data Wrangling is one of those technical terms that are more or less self-descriptive. The term "wrangling" refers to rounding up information in a certain way.

This operation includes a sequence of the following processes:

- Preprocessing — the first condition that follows data acquisition.
- Standardizing data into a format that is clear. A user profile events record, for instance, needs to be sorted by event type and time stamp;
- Eliminating noise, missing, or incorrect data from the data.
- Combining information from several sources or data sets to create a coherent whole. For instance, you could need to obtain performance data for the current marketing campaign stage if you run an affiliate advertising network;
- Comparing data to already-existing data sets. If, for instance, you already have user data for a specific time frame and combine these sets to create a larger one;
- Data filtering using preset processing parameters.

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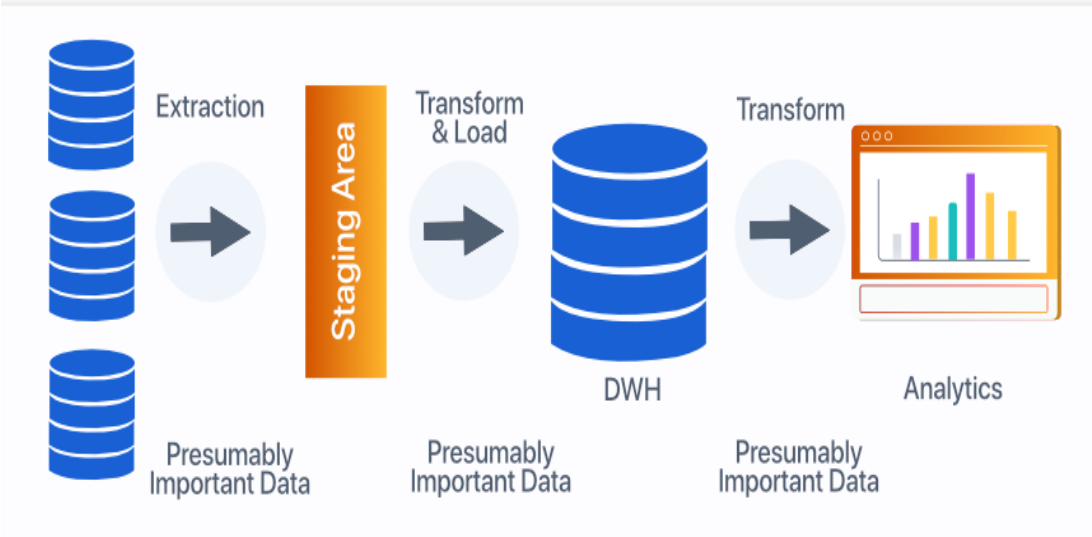
Data Wrangling Machine Learning Algorithms

The data set is gathered throughout the process of developing the analytical model using Deep Learning or Machine Learning from a variety of sources, including a file, database, sensors, and more. However, the analysis process cannot be carried out immediately using the acquired data. Data preparation is thus carried out in order to address this issue. It consists of the following two methods: data preprocessing and data wrangling.

Fig.2



Data Preprocessing and Data Wrangling

It is a method for transforming unclean data into clean data sets. In other words, anytime data is acquired from various sources, it is done so in a raw manner that makes analysis impossible. Therefore, a few procedures are carried out to transform the data into a modest clean data set. This method is used before iterative analysis is carried out.

The following categories of machine learning algorithms are generally in use:

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

- Supervised machine learning techniques are used to standardize and combine various data sources:
- Classification and normalization are used to flatten independent variables in data sets and restructure data into a more unified form. Classification is used to detect well-known patterns.
- Unsupervised machine learning methods are used to explore unlabeled data
- Clustering is employed to find distinctive patterns

Working style of Data Wrangling

Explore

A dataset can be explored or discovered to find patterns, trends, and information that is either missing or incomplete. The majority of exploration takes place prior to producing reports, data visualizations, or training models, but it's also typical to find surprises and insights in a dataset while conducting research.

Cleanse

Data that has been manually entered, incomplete, automatically gathered from sensors, or even equipment that isn't working properly frequently contains errors. To improve data quality, data cleansing fixes entry errors, eliminates missing data, removes duplicates and outliers (where necessary), and imputes null values using statistical or conditional modeling.

Transform

It is crucial to perform data transformation or data structuring early on because failing to do so could jeopardize the remainder of the wrangling process. Putting the raw data in the proper structure and format so that it may be used for a report, data visualization, analytic, or modeling process is known as data transformation. It can entail adding fresh variables (also known as features) and processing the information mathematically.

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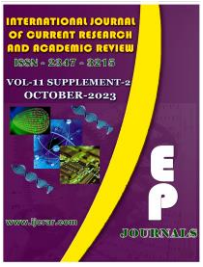

Enrich

By including other sources, such as reliable third-party census, firmographic, or demographic data, enrichment or blending increases the use of a dataset. A company's data may be further illuminated through the enrichment process, and it may also generate fresh concepts for future collection and archiving of customer data. This is a chance to carefully consider what new data might bring to a report, model, or business procedure.

Validation

Validation rules are iterative programming sequences that check the security, reliability, and consistency of data. Examples of validation include making sure that attributes that should naturally be dispersed are distributed uniformly (such as birth dates) or checking field accuracy by running a check across data. This phase of the data wrangling process is crucial.

Store

The final stage in the wrangling process is to keep or maintain the finished product along with all the other phases and modifications so they may be examined, comprehended, and used again in the future

Data Wrangling solves major Big Data / Machine Learning challenges

Data Exploration

Exploratory is the data processing operation's most basic consequence of data mapping. You can use it to comprehend the kind of data you have and what you can do with them. While it may seem obvious, this step is frequently distorted in favor of manual methods that seem to be more effective.

Unfortunately, a lot of important insights about the form and organization of data are frequently excluded or overlooked by these approaches. In the end, you'll have to redo it correctly to allow for more data processing procedures. Automated Data Wrangling analyzes data more thoroughly and provides a wealth of additional insights that might be helpful for business operations.

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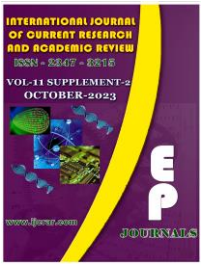

Unified and Structured Data

It is fair to say that data always comes in as a glorious mess in different shapes and forms. While you may have a semblance of comprehension of "what it is" and "what it is for" — data, as it is in its original form, raw data is mostly useless if it is not organized correctly beforehand.

Data Wrangling and subsequent Mapping segments and frames data sets in a way that would best serve its purpose of use. This makes datasets freely available for extracting any insights for any emerging task.

On the other hand, clearly structured data allows combining multiple data sets and gradually evolve the system into more effective.

Data Clean-up from Noise / Errors / Missing Information

In any data set, there will almost always be noise, mistakes, and missing numbers. There are several causes for that. Technical hiccups, Accidental Mislabeling, & Human error (so-called soapy eye). Its effect on data processing quality is widely established; as a result, results are of lower quality, which makes corporate operations less successful.

It is considerably worse for machine learning algorithms when the data is noisy and inconsistent. The algorithm may become ineffective for its intended function if it has been trained on such datasets. This is why data wrangling is there to right the wrongs and make everything the way it was supposed to be.

Minimized Data Leakage

Data leakage is frequently regarded as one of the most difficult problems in machine learning. Additionally, the threat increases exponentially because data processing is done using ML algorithms. The problem is that prediction depends on correct data. Furthermore, if the calculated prediction is based on shaky evidence, it is equivalent to a wild guess.

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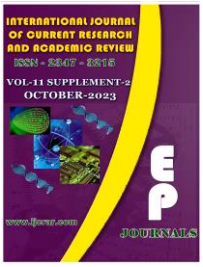

The phrase describes situations in which the predictive model is trained using data that is not part of the training data set. Any unreliable or unlabeled information can be considered "outside data" for model training. As a direct result, you receive false forecasts from an algorithm, which can have a negative impact on how well your firm is run. The typical cause is a disorganized data structure without distinct border signifiers.

Data Wrangling in Python

Numpy (aka Numerical Python) — the most basic package. Lots of features for operations on n-arrays and matrices in Python. The library provides vectorization of mathematical operations on the NumPy array type, which improves performance and accordingly speeds up the execution.

Pandas — designed for fast and easy data analysis operations. Useful for data structures with labeled axes. Explicit data alignment prevents common errors that result from misaligned data coming in from different sources.

Matplotlib — Python visualization module. Good for line graphs, pie charts, histograms, and other professional grade figures.

Plotly — for interactive, publication-quality graphs. Excellent for line plots, scatter plots, area charts, bar charts, error bars, box plots, histograms, heatmaps, subplots, multiple-axis, polar graphs, and bubble charts.

Theano — library for numerical computation similar to Numpy. This library is designed to define, optimize, and evaluate mathematical expressions involving multi-dimensional arrays efficiently.

Data Wrangling in R

- Dplyr - essential data-munging R package. Supreme data framing tool. Especially useful for data management operating by categories.
- Splitstackshape - an oldie but goldie. Good for shaping complex data sets and simplifying the visualization.

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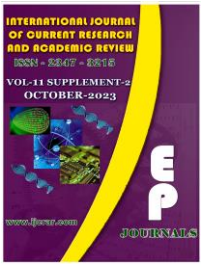

- JSOnline - nice and easy parsing tool.
- Magrittr - good for wrangling scattered sets and putting them into a more coherent form.

Conclusion

It takes a lot of focus and work to stay on your path through the information forest. However, the procedure becomes much more straightforward and manageable with the aid of machine learning algorithms. You have a competitive advantage over other companies in our field when you gather insights and base your business decisions on them. But without completing our homework first, it won't work, which is why we need data wrangling methods in place.

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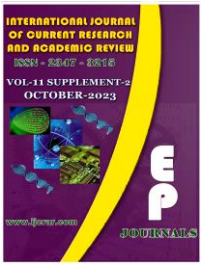

Full Length Article **IJCRAR/FL/96**

Artificial Intelligence and Machine Learning in 5G Network Security

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Abstract

Recent technological and architectural advancements in 5G networks have proven their worth as the deployment has started over the world. Key performance elevating factor from access to core network are softwareization, cloudification and virtualization of key enabling network functions. Along with the rapid evolution comes the risks, threats and vulnerabilities in the system for those who plan to exploit it. Therefore, ensuring fool proof end-to-end (E2E) security becomes a vital concern. Artificial intelligence (AI) and machine learning (ML) can play vital role in design, modelling and automation of efficient security protocols against diverse and wide range of threats. AI and ML has already proven their effectiveness in different fields for classification, identification and automation with higher accuracy. As 5G networks' primary selling point has been higher data rates and speed, it will be difficult to tackle wide range of threats from different points using typical/traditional protective measures. Therefore, AI and ML can play central role in protecting highly data-driven softwareized and virtualized network components. This article presents AI and ML driven applications for 5G network security, their implications and possible research directions. Also, an overview of key data collection points in 5G architecture for threat classification and anomaly detection are discussed.

Keywords: Natural language processing (NLP) Database, Computer vision, Reinforcement learning, Neural network, Overfitting.

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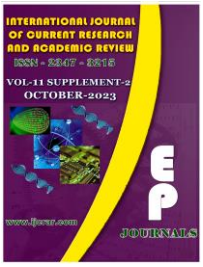

Introduction

The continuously evolving communication network architecture to integrate diverse range of devices with unique requirements for different network parameters has resulted in sophisticated challenges for net- work security. The recent developments in 5G Net- works and beyond are facilitating the immersive growth of data communication by providing higher data rates and speeds. Such gigantic increase in data traffic and connected devices mean more vulnerabilities, threats, and attacks resulting in catastrophic damages financially, socially and on humanity. Therefore, scrutinizing and analysis of such Big Data for suspicious activities can not only be achieved with traditional/typical methods. In this context, Artificial intelligence (AI) and Machine Learning (ML) [1], [2] are envisioned to play a key role in solving previously considered NP-hard, and complex optimization problems. The Self-Organizing networks, intelligent and adaptive algorithms implemented in different parts of network architecture paved the way for use of AI and ML with even higher performance gains at smaller costs. The ITU has also established a standard Y.3172, which outlines the architectural framework and requirements for different use cases of ML in future networks including IMT 2020.

Digital bandit have also proven their penetration skills even to most secure and encrypted networks by exploiting vulnerabilities. Such vulnerabilities lead to data theft, cyberattacks, infrastructure damage, ransom demands, blackmailing, disruption of critical services, threats to democracy and fatal to human lives often reported as breaking news. Thus, increasing the necessity to also in- vest in methods which enables safer and secure communications with transparent user policies, trust models and End-to-End (E2E) visibility. Moreover, 5G and beyond future networks architecture has seen a paradigm shift from the concept of dedicated networks resources for dedicated network functions to more dynamic virtualization, cloudificiation, orchestration, automation and softwareization of network functions from common/shared network resources [3]. These factor impose a greater risk to network security and user data if the safety protocols are unable to not only detect threats and attacks but also prevent them in real-time (with minimum delay). Such real-time threat/anomaly detection in terabytes of data require assistance of AI and ML. The data collection points can be set in different parts of the network from access to core network and fed to ML/AI engines for real-time threat detection and attack prevention.

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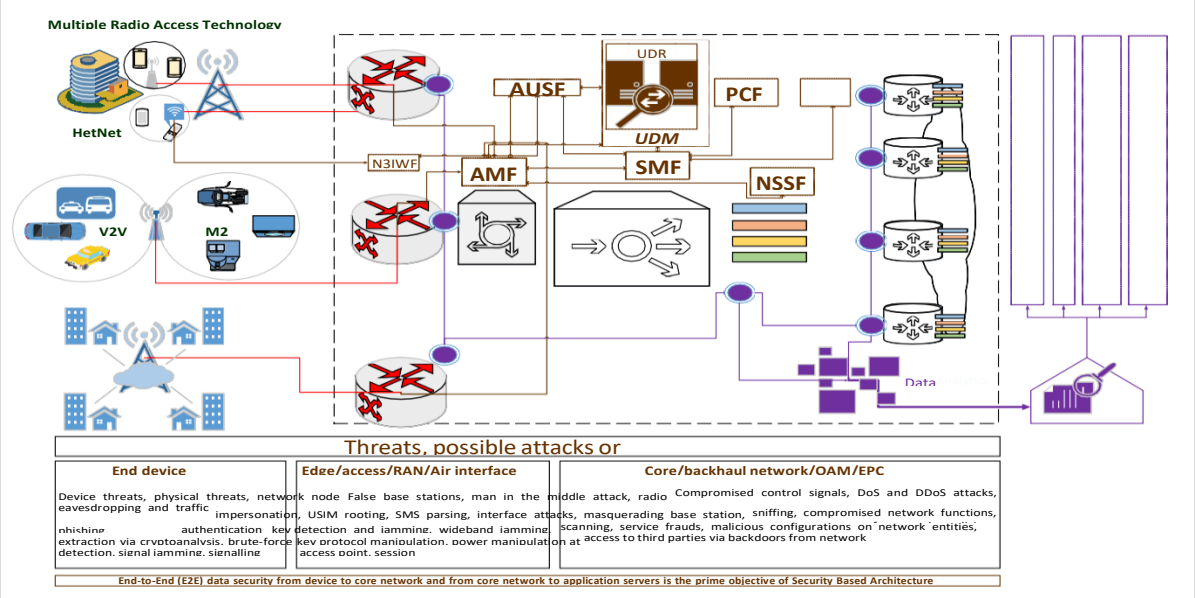
Fig.1 Envisioned applications of AI and Machine-Learning in 5G Network Architecture



Network shows the envisioned architecture for integrating AI and ML to detect threats for classification and testing of security protocols against detected threats/attacks in 5G and future networks. Such AI and ML assisted security can provide cost efficient and sustainable solutions.

The organization of the upcoming content of the article is as follows. Section II highlights the abstract level details of threats, attacks, and vulnerabilities at different points in 5G networks along with the latest developments and standardization activities related to 5G and future networks security.

Section III discusses the taxonomy of AI and ML related technologies along with their implementation gains. Then, Section IV presents opportunities, use cases, applications and advantages of different field of AI and ML in 5G security. Section V presents challenges and possible future research directions of AI and ML assisted network security. Finally conclusions are given in Section VI.

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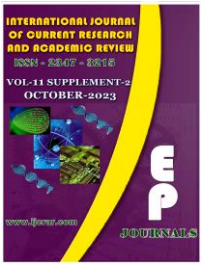

5G Networks Security

The 3GPP Technical Specifications Group Services & Systems Aspects (TSG SA3) in its Release 14 high- lighted the 17 key threat / areas and possible solutions for security architecture of 5G networks. The security architecture, procedures and requirements for 5G systems were then formulated in Release 15 (R15) in June 2019 [4]. The R15 includes security standards for standalone and non-standalone Enhanced Mobile Broad- band scenarios, whereas, upcoming R16 and R17 will be focusing on security standards for massive Machine Type Communication and Ultra Reliable Low Latency Communications. The new security features aims to provide E2E security along with flexibility of incorporating multiple authentication frameworks, and higher-layer security protocols to support security for Service Based Architecture (SBA) in 5G. The SBA and network slicing in 5G networks allows higher modularity in the design measure of security protocols. The E2E security architecture can be segregated into two groups. The first one named Network Access Security defines procedure and requirements of securely connecting end-device to radio access network. These procedures secure the device connectivity from end device and edge/RAN domains threats as shown in Fig. 1. From here on, ensuring protection of data and privacy from access network to core network and beyond can be referred as Network Domain Security Highly software-centric and dynamic 5G network architecture where user data is traversing through several network slices and layers, also require agile, adaptive and robust security management and automation. Depending on different network slices for different services, the security requirements are also different from lightweight, middleweight to heavyweight security. These hierarchical security levels suiting needs of different slices can more easily be implemented with software-based evolving techniques. Contrary to this, manual or traditional need based upgrades to network security are no more feasible, therefore, security automation should be an integral part of the overall network. Leading industry partners are now planning to leverage AI and ML to incorporate network security for 5G and beyond wireless networks. Recent advancements in AI and ML can enhance the performance of next-generation 5G networks. AI and ML have opened gateways to new robust and dynamic solutions in the domains of security, privacy, and threat detection in 5G systems. AI and ML has shown significant potential in terms of performance gains for wireless systems in the domains of beamforming, massive multiple input multiple output (MIMO), and network slicing. Different use cases and possible applications of AI and ML for 5G are also shown in Fig. 2.

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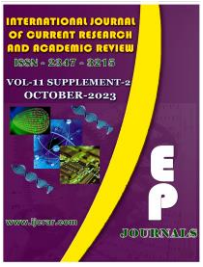

Artificial Intelligence and Machine Learning

The concept of using AI and ML in security and privacy is not new but their feasibility and performance superiority gained attention with the evolution of deep learning (DL) algorithms. Most of the methods before the development of DL were dedicated to model the attack patterns with certain characteristics that are not robust in nature, but with deep AI and ML, it is expected that systems will become more resilient towards new sophisticated threats and attacks with dynamic characteristics. Because, attackers use sophisticated techniques like obfuscation, polymorphism or impersonation to avoid detection. From packet capturing and analysis to big data insights, AI and ML can be leveraged to notify the threats not detected by conventional techniques. The pattern- based learning at the core supported by softwarization and virtualization provides agility and robustness to timely counter the threats and attacks.AI is showing a positive impact on the information security field. AI algorithms are being adopted to address security and privacy issues. The information security industry is generating more and more data that opens them to advance threats and AI could be a powerful antidote. The first generation of AI solutions are focusing on scrutinizing data, detect threats and assist humans in the remediation plan. The second generation of AI will make the systems more autonomous and only leave the critical support issues to humans [5].

Applications of AI and Machine Learning - for 5G Security

Mostly, AI and ML algorithms are data-hungry in nature which means that data is needed to train the model for effective functioning. In the era of 5G, data generation, storage, and management is not difficult as we have high computational power, exponential data growth, and data sources. The network can be maintained, accessed and analyzed for possible threats, attacks and vulnerabilities using AI and ML at a lower cost of computing, and affordable infrastructure. Fig. 3 summarized the various applications of AI and ML in network security. AI and ML models can be used to detect suspicious activities in real-time by analysing network activity patterns and parameters. Classification algorithms can be used to detect anomalies by monitoring network parameters such as throughput and network error logs. Clustering algorithms can be used to categorize various kinds of threats and loopholes in network security. The models such as statistical inference attacks and generative adversarial networks (GAN) can generate fake datasets

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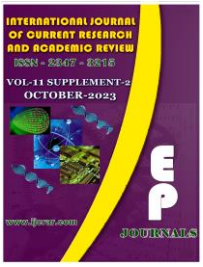

to develop and evaluate new security measures as well as testing and implementing evolved security protocols and algorithms. The research in developing private AI and ML models have seen some significant progress in secure computation, encryption, privacy, and federated learning. Hybrid models are created by adopting techniques from different fields to make models efficient, faster and generalized. The most common and popular example is the differential privacy introduced by Google security and privacy team [6]. The secure computation field is making new progress by aggregating distinct protocols for faster computations [7]. Some examples include Gazelle, TAPAS, and Faster CryptoNets that are used for secure computation with homomorphic encryption. Secure NN is an ML solution that uses comparison-based operation of neural networks for bit extraction and secret sharing [8]. Federated learning and secure enclaves are also using AI and ML-based models such as Slalom, Chiron and Ekiden. Another recent trend is the development of generic and robust anomaly detection algorithms which deals with unknown attacks [9]. AI and ML can be applied to deal with most of the applications such as antivirus scanner systems, intrusion detection, spam filters, and fraud detection systems. The methods generally work on data generated by network traffic, host processes, etc. Unsupervised algorithms such as neural networks and clustering can be used to assist humans in identifying suspicious activities The 5G and beyond network relying on SBA, independent decentralized network functions and third-party servers will pose a greater threat in terms of Denial-of- Service (DOS) and cyber-attacks. Thus, dedicated agents according to the domain of network components can better safe-guard these components in particular and overall system in general. Various AI and ML solutions have been presented to deal with decentralized networks [10]. The recent solutions are using several reinforcement learning (RL) and deep reinforcement learning (DRL) techniques to deal with such attacks [11]. In case of jamming attacks where, the hackers jam the radio frequency (RF) signals, DRL based solutions were developed that select appropriate frequency channels and avoid attack using an optimal policy learned on previous observations. Cyber-physical attacks manipulate data to gain control of the system. These kinds of attacks usually occur on autonomous systems such as smart vehicles [12]. DRL provides autonomous systems the ability to learn from the time-varying observations to robust and dynamic. DRL systems show decent progress in connectivity preservation among robots to support efficient communication Deep Learning (DL) is also providing its benefit to cybersecurity solutions as it can automatically learn patterns from past entries to avoid future intrusion and identify irregular patterns. DL has been successfully deployed in infrastructure-level security

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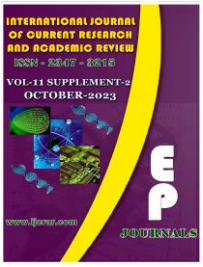

(anomalies detection on the physical network), software level security (malware, virus and botnet detection in the mobile net- work) and user-level security (private information protection) [13]. Different variations of DL networks such as auto-encoders, dense networks, and Convolutional Neural Network are used in several security applications including malware detection, DOS probing, flooding, instant signal-to-noise ratio variations, and various other cyber-attacks. At the software-level, DL networks are used in the classification of malicious applications, spams, unknown traffic, and botnet. In the case of user privacy, DL has shown its potential in data sharing problems, information leakage, and privacy preservation. Table I summarizes the key enabling technologies among AI and ML for potential security applications along with their advantages.

Conclusion

This paper presents AI-assisted technologies, scenarios and application for security of 5G and beyond wireless networks. The highly dynamic traffic patterns, service-based network architecture, distributed network functions and authentication over multiple servers in 5G and beyond networks require relatively robust, agile and fully automated security framework. Such framework is built-upon smart AI technologies. AI can significantly improve the security for distributed ad-hoc setup of network infrastructure providing different network functions. At this stage, semi-automated security framework is more suitable, however, with continuing evolution in AI technologies and feasibility studies of safe implementation of these technologies will decide the end goal of complete automation. Substantial research is needed to address the challenges and issues before AI fully takes over the digital automation.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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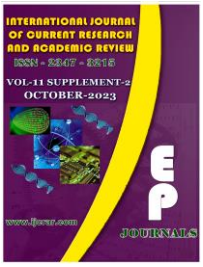

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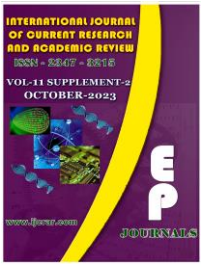

Full Length Article **IJCRAR/FL/97**

Humanoid Cognitive Robots That Learn by Imitating

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Abstract

While the concept of a conscious machine is intriguing, producing such a machine remains controversial and challenging. Here, we describe how our work on creating a humanoid cognitive robot that learns to perform tasks via imitation learning relates to this issue. Our discussion is divided into three parts. First, we summarize our previous framework for advancing the understanding of the nature of phenomenal conscious- ness. This framework is based on identifying computational correlates of consciousness. Second, we describe a cognitive robotic system that we recently developed that learns to perform tasks by imitating human-provided demonstrations. This humanoid robot uses cause–effect reasoning to infer a demonstrator's intentions in performing a task, rather than just imitating the observed actions verbatim. In particular, its cognitive components center on top-down control of a working memory that retains the explanatory interpretations that the robot constructs during learning. Finally, we describe our ongoing work that is focused on converting our robot's imitation learning cognitive system into purely neuro computational form, including both its low-level cognitive neuromotor components, its use of working memory, and its causal reasoning mechanisms. Based on our initial results, we argue that the top-down cognitive control of working memory, and in particular its gating mechanisms, is an important potential computational correlate of consciousness in humanoid robots. We conclude that developing high-level neuro- cognitive control systems for cognitive robots and using them to search for computa tional correlates of consciousness provides an important approach to advancing our understanding of consciousness, and that it provides a credible and achievable route to ultimately developing a phenomenally conscious machine.

Keywords: Mechanisms, cognitive robots, machine consciousness, artificial consciousness, neural network gating cognitive phenomenology.

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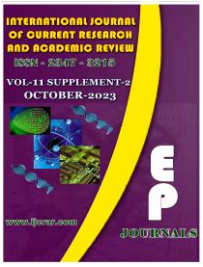

Introduction

In this paper, we use the word "consciousness" to mean specifically phenomenal consciousness unless explicitly indicated otherwise. The term "phenomenal consciousness" has been used historically to refer to the subjective qualities of sensory phenomena, emotions, and mental imagery, for example the color of a lemon or the pain associated with a toothache (Block, 1995). Searle has presented a list of essential/defining features of consciousness, including subjectivity, unity, qualitativeness, situatedness, and sense of self (Searle, 2004), and a detailed analysis of this term can be found in Chapter 3 in Tani (2017). Recent work in philosophy has argued for an extended view of phenomenology that includes one's cognitive processes and hence is referred to as cognitive phenomenology, as we will elaborate below. In the following, we focus on conscious qualities specific to cognitive phenomenology in particular, as opposed to the more historically emphasized aspects of consciousness such as sensory qualia.

How can research based on cognitive humanoid robots con- tribute to our understanding of consciousness? Consciousness is not well understood at present, and many philosophers have questioned whether computational studies or cognitive robots can play a significant role in understanding it. Such arguments cannot be refuted at present because there is currently no convincing implementation of instantiated consciousness in a machine, as described in Reggia (2013). Conversely, none of these past arguments appear sufficiently strong to convince many current investigators that machine consciousness is impossible (Reggia *et al.,* 2015). For this reason, it seems prudent to us to push ahead investigating this issue until the matter can be definitively resolved one way or the other, and it is in that context that we describe our research efforts below.

Here, we describe how our past and ongoing work on creating a humanoid cognitive robot that learns to perform tasks *via* imitation learning relates to consciousness studies. Our key contribution here is to expand and develop a concrete framework for investigating the nature of consciousness in cognitive robots. Our discussion is divided into three parts. First, we summarize our framework for advancing the understanding of the nature of phenomenal consciousness based on studying the computational explanatory gap (CEG) (Reggia *et al.,* 2014). The main goal in this work is to identify neurocomputational correlates of conscious- ness. We believe that

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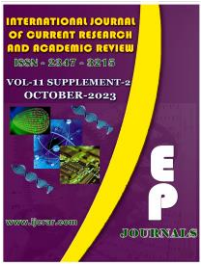

identifying such correlates will be possible in cognitive robots, based on concepts that have emerged recently in the philosophical field of cognitive phenomenology, and we explain why that is so.

The core idea of our framework for studying consciousness in robots is that investigating how high-level cognitive processes are implemented *via* neural computations is likely to lead to the discovery of new computational correlates of consciousness. Accordingly, in the second part of this paper, we describe a cognitive robotic system that we recently developed that learns to perform tasks by imitating human-provided demonstrations.

This humanoid robot uses cause–effect reasoning to infer a demonstrator's goals in performing a task, rather than just imitating the observed actions verbatim. Its cognitive components center on top-down control of a working memory that retains the explanatory interpretations that the robot constructs during learning. Because, as we explain below, both cause–effect reasoning and working memory are widely recognized to be important aspects of conscious human thought, we suggest that exploring how the cognitive and memory mechanisms embodied in our imitation learning robot provide an excellent test of our framework for studying consciousness in machines.

A Computational Approach to Understanding the Nature of Consciousness

In the following, we propose a *computational* framework for investigating consciousness. We begin by summarizing the concept of a CEG, and we explain why recent advances by philosophers interested in cognitive phenomenology makes this barrier relevant to consciousness studies. We then describe our proposed framework for studying consciousness that is based on identifying its computational correlates.

A Cognitive Humanoid Robot that Learns by Imitating

In the previous section, we described a framework for studying aspects of consciousness based on developing computational/ robotic systems that account for high-level cognitive functions in neuro computational terms. To pursue this approach, two things are needed: a physical robotic

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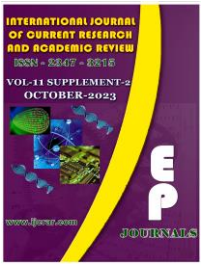

system that supports some aspects of high-level cognitive functionality, and an underlying neural control mechanism that implements that functionality.

Here, we describe our recent work on the first of these two requirements: Our efforts to create a cognitive humanoid robot that that can be used to explore consciousness-related and other issues (Katz *et al.,* 2017a,b). Why would one want to consider studying the CEG in a robot instead of simply going the easier route of computer simulations? One answer is that a cognitive system in a robot is embodied: It interacts with and causally acts on a real external environment, and in that sense there is a true "mind-body" problem, at least to the extent that one is willing to call a robot's cognitive control system a mind.

Further, it has been claimed that the ability to ground a cognitive robotic system's symbols in the robot's sensory data stream is a computational correlate of consciousness (Kuipers, 2008). While this suggestion is controversial (Chella and Gaglio, 2012), it suggests that some computational correlates may be particularly evident in a cognitive system that interacts with the real world as part of a physical system.

Neurocomputational Implementation of Top-Down Gating

The current implementation of our robotic system for imitation learning provides a good illustration of the CEG as we portrayed it above: high-level cause–effect reasoning and planning.

Successfully implemented using symbolic AI operations, and low-level sensorimotor control successfully implemented using neural network methods. Given the framework that we have outlined above (see A Framework for Investigating Consciousness), our specific research agenda is clear: search for computational correlates of consciousness by replacing CERIL's causal reasoning and planning algorithms with a purely neurocomputational system that provides the same functionality.

Such a replacement is beyond the reach of current neurocomputational technology and is a very challenging target. However, it provides a concrete example of attempting to bridge the CEG, and in this context it has the potential to reveal candidates for computational correlates of consciousness as per our research framework and cognitive phenomenology.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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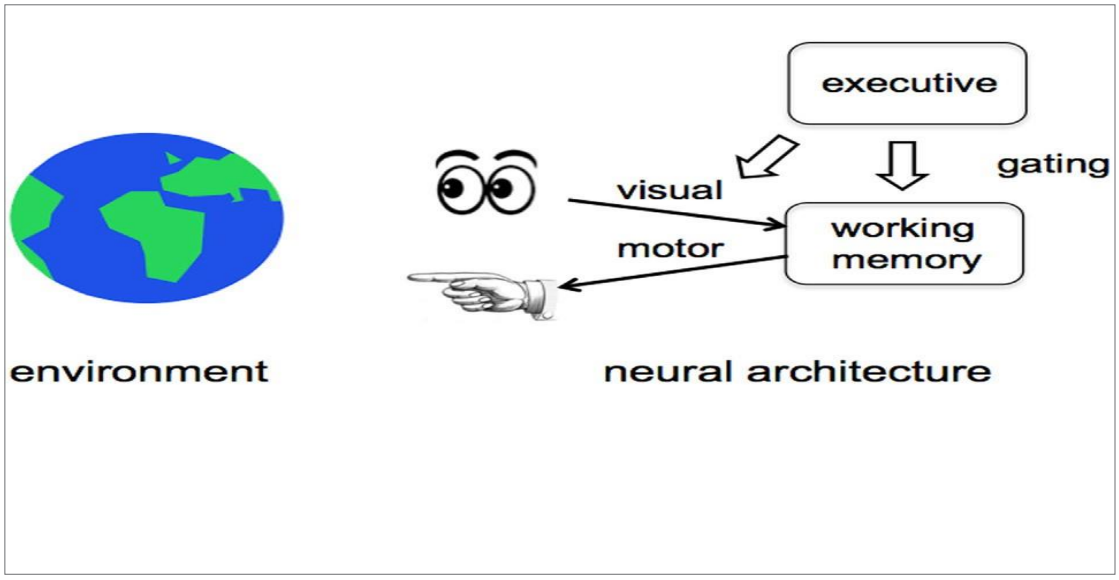
Fig.1



And recall problem-solving information such as what objects are in the workspace and their locations. The executive control module, of primary interest here, is trained to activate/de-activate the functions of the other components in the system. This gating control mechanism thus determines whether or not inputs are saved in working memory, when information stored in working memory is to be deleted, and when outputs are to be produced. Using Hebbian learning methods, it is possible to "program" GALIS to carry out tasks that require a sequence of motor actions to be executed that are specific to solving a given problem.

For example, we trained GALIS to play simple card games that required it to retain in working memory the previous cards that it had seen, and to base decisions about its actions on the contents of working memory. Not only did GALIS perform the task well in solving hundreds of randomly generated card game problems, but it was also found to exhibit some significant similarities to people in terms of how many steps it took to solve card game problems of various difficulty levels (Sylvester and Reggia, 2016) as well as in memory capacity in separate experiments simulating human n-back problem solving (Sylvester *et al.*, 2013).

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International Journal of Current Research and Academic Review

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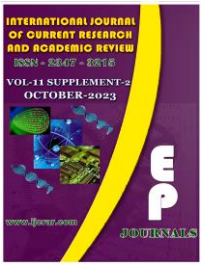

Top-Down Gating of Working Memory

A key hypothesis of our work addressing the CEG described above is that the top-down gating of working memory (and potentially of other operational components) is an important computational correlate of consciousness. At the least, we believe that studying this aspect of the term *working memory* can be defined as the memory mechanisms that store and process information for a brief period of time. Human working memory has very strict capacity limitation Psychologists have found that we can only retain about four separate items in our working memory at any point in time (Cowan *et al.,* 2005). If one tries to store more information, the individual items stored may interfere with each other and, in any case, the items will be replaced or decay away over time as problem solving evolves. The important point here in terms of our work concerning the CEG is that psychologists consider the information processing done by the working memory system to be part of our *conscious* cognitive processes. They have found that storing, manipulating, and recalling information from working memory is conscious and reportable (Block, 2011; Baddeley, 2012). Thus, according to the tenets of cognitive phenomenology (discussed in Section

Conclusion

Current understanding of phenomenal consciousness is widely recognized to be very incomplete, and its relationship to cognition and the core neuroanatomical structures that support it continue to be the focus of recent work. This holds both with respect to consciousness in people and with respect to issues that surround the question of whether machines or animals can be conscious. The primary suggestion in this paper is that the CEG is an important contributing reason for our limited progress toward a better understanding of phenomenal consciousness. This view- point runs counter to some past philosophical arguments that understanding the mechanisms of human cognition will not get us any closer to solving the "hard problem" of conscious- ness. However, the growing recognition among contemporary philosophers who support the idea of cognitive phenomenology suggests, to us at least, that cognition and consciousness are sufficiently intertwined that computational exploration of the CEG may productively lead to insights about the nature of conscious, both in machines and people. It is for this reason that we have suggested a framework for studying consciousness that is based on searching for neurocomputational

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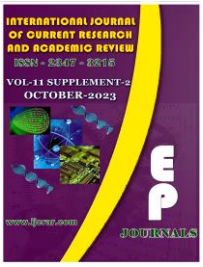

correlates of consciousness in cognitive-level machines. Ultimately, this general framework, if applied broadly, may turn out to be critically important to providing new knowledge about our basic notions of conscious- ness. Our view is that the CEG is a central issue for consciousness studies, and one that merits substantial investigation over coming years. Doing this should lead us to discoveries about the computational correlates of consciousness.

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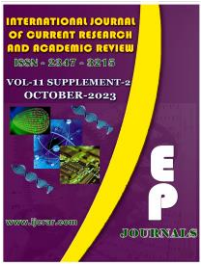

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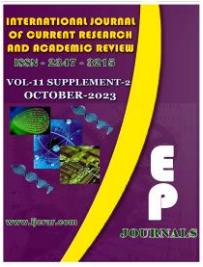

Full Length Article **IJCRAR/FL/98**

Estimating the Role of Blockchain, Deeplearning & Cryptography Algorithms in Cloud Security

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Abstract

Cloud network has become very popular in recent days due to its accessibility merits. The data stored in the cloud environment are accessible by the clients from any location. A reliable shielding approach will protect the data stored in the cloud from the hackers and malwares. Blockchain is one of the recent technologies implemented to the cloud network for storing the location of the saved data in an encrypted ledger format. This saves the stored data location without exploring it to the hacker's algorithm. Hence the hacking algorithm fails by not knowing the location to be targeted. Deep learning is an advanced technique developed to act like that of the human neurological analysis on several problems. Implementation of deep learning algorithm to the cloud security module identifies the movement of malware and spywares in the cloud storage. Similarly the cryptography is an old technique structured to hide the information with a cover data or cover image. It allows the hacking algorithm to extract only the useless data. This paper reviews the recent advancements in the cloud security with blockchain, deep learning and cryptographic models.

Keywords: Blockchain, Deeplearning, Cryptography Algorithms, Cloud Security.

Introduction

The data which are stored in remote place are represented as cloud storage. The cloudstorage systems are even utilized to do manipulation and algorithmic operation in its ownplace. For that a remote server is connected to the cloud storage. Based upon the utilization ofspace from the

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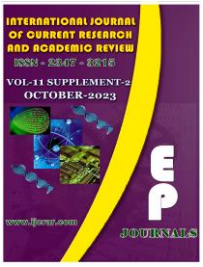

cloud environment a nominal amount will be collected from the user. Thestorage space in cloud environment are usually very large and that to be segregated intodifferent piece for different user. In general, the cloud storage systems are categorized intothreetypes as public, private and hybrid cloud.

Private Cloud

The private cloud is a system that gives a dedicated storage space for each user andthat can't be accessed by the other users. The private cloud systems are employed in the application that requires a customized secure process and computing. The user also has achoice to install or upgrade their hardware and software modules in the private cloud systemand the visibility ofthedatatotheuserisvery high in this system.Thedatathatarecomputed from the cloud system have very larger speed of operation and it reduces thecomputation burden to the local storage system. Hence the performances of the private cloudsystems are predictable. Similarly the cost requirement for maintaining such system is alsolimitedand predicted as thesystem is notgoingto expandat anyrequirement.

Hybrid Cloud:

Hybrid cloud is a combination of both public and private cloud for ensuring a smoothcomputation process. In general, the data that can be operated without care will be processedin the public cloud and the data that needs more attention will be processed in the privatecloud. By applying the hybrid cloud to the system, the corporates can save their expenses onmanaging the data. Also it provides more security than the public cloud system and more operating efficiency than the privatecloud system.

Community Cloud:

Community cloud is the system that allows several organizations to share their workplace on the same cloud environment. In general the community cloud systems are utilized bythe government organizations or the corporates that have more than one company for the operations. The community cloud systems are more flexible and easy to share information among their own

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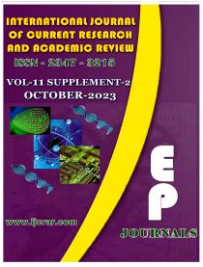

concerns. It also reduces the cost by avoiding a separate cloud system for each company. However, the community cloud systems are costly than the public cloud systems. Table.1 explores the merits and demerits of each cloud system based on their operating nature.

Table1.Performance analysisofvariouscloud systems

Cloud System	Merits	Demerits
Public Cloud	• Low cost • Open to all locations • Scalability • Easyto setup	• Poor security • Performance related to internet • Not customizable
Private Cloud	• Secure • High privacy • Better performance	• High cost • Restricted operation • Minimum scalability
Hybrid Cloud	• Secure and flexible • Cost effective • Risk management	• Networking issues • Poor service reliability • Questionable compatibility
Community Cloud	• Cost effective • Data Sharing • Secured infrastructure	• Slow data adoption • Fixed storage space • Not suitable for all

Related Work

Block chain:

The cloudsystemthatare managed and operated by a third-party security systemusing blockchain technology is represented as BaaS (Blockchain as a Service). BaaS acts likea hosting service of a cloud system that secures the data from its back end. The architecturalview of BaaS is shown in Figure 1. Here the information available in the cloud system areincorporated to the users through

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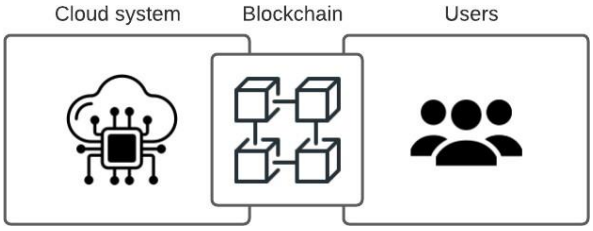
a blockchain system, that stores the information of dataaccess by the users in an encrypted digital form. This ensures the accessibility of the data byother users connected to the same cloud systems. BaaS systems are very suitable for publicand community based cloud systems that allows the users to use only their required data.Though the BaaS based cloud architectures are costly in nature and that needs trained people for monitoring and operational control.

Figure.1 Architecture of a BaaS



Conclusion

Cloud data sharing has become very popular in recent days as it allows the users toutilize a greater number of storage spaces than the regular storage system. However, securityhas become questionable for cloud systems as more users access the data from a same cloudsystem. To avoid this, certain organizations employ private cloud environments. Even suchprivate cloud environments are open to vulnerability attack from the hackers. Hence certainhybrid and multi layered security algorithms are developed to address such issues. This paper analyzes the architectural difference among different cloud models and explores the techniques designed based on blockchain, deep learning and cryptography methodologies on addressing the cloud security issues.

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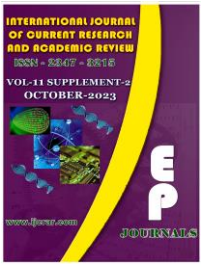

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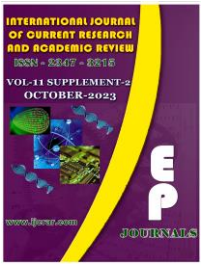

Full Length Article **IJCRAR/FL/99**

An Agent Based Distributed Multi-Relational Data Mining Using Jade

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Abstract

Mining distributed databases is coming out to be a fundamental computational problem. A single model can be constructed by moving all the data from each database to a central site, this is considered as a common approach for mining distributed databases. For mining multi-relational databases, an efficient algorithm is needed such as association rules. Most of the existing data mining approaches searches for single data table rules. But, most of the databases are relational. Therefore, to mine important rules in multiple tables(relations) we have introduced a novel distributed data mining method in our paper and have combined this method with the k-means algorithm to enhance the efficiency. Inorderto accomplish this, an intelligent agent is used. The main purpose of introducing an intelligent agent is to observe and to act upon an environment to achieve its goal.

Keywords: Knowledge Discovery of Database (KDD), Distributed Data Mining, Agent Mining, Multi Agent System, Centralized Database Systems, Multi-Agents System (MAS), Data Mining, Business Associate Rules.

Introduction

The rapid developments in information and communication technology has contributed to the appearance of distributed environments for computing, this comprises large volumes of several, different sources of data and computing units. The best example for this distributed environment is the Internet, which includes more databases and data streams which deals with several areas, such as meteorology, oceanography, economy and so on.

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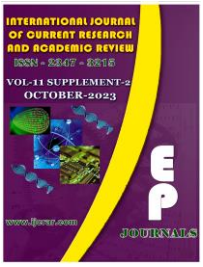

In these cases, the distributed environments requires the aggregation of distributed information which is known as the classical knowledge discovery process in data warehouse for central processing. But there are reasons where this process becomes either ineffective or impracticable.

The reasons includes:

1) Storage cost
2) Communication cost
3) Computational cost
4) Private and sensitive data

Data mining primitives:

A data mining query is defined in terms of data mining task primitives. With the help of these queries or primitives only the user can interactively communicate with the mining system. Mining primitives specify, (1) the set of task relevant data to be mined (2) the kind of knowledge to be mined (3) the background knowledge to be used in the discovery process (4) the interestingness measures and thresholds for pattern evaluation (5) the expected representation for visualizing the discovered patterns.

Data mining classification:

In the field of data mining and KDD (Knowledge Discovery of Database) data search association rule mining is used and it is an important research topic in the corresponding field. Classification maps data into pre-defined groups or classes and since the classes are defined before examining the data it is known as supervised learning. This scholarship is based on traditional statistics; it provides ideal results even if the sample sizes are high. Classification is an important task for applications such as text categorization, tone recognition, image classification, micro-array gene expression, protein structure predictions, data Classification etc.

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Agent Technology:

Agent Technology is a rapidly developing field of inquiry. Agent Technology is to shortly commence the development phase of its multi-protocol network. Intelligent Agent is an entity of agent technology which observes the environment, manipulates the environment and conducts its actions to achieve the goal. All the possible sequences of precepts to every action are represented as a mathematical function and it is defined as agent program. The action that the agent can perform is either to a coefficient or feedback elements or it can be done with a function or constant which affects the actions performed eventually.

Agent characteristics:

The main two characteristics of agent are intelligent ability and acting ability. The ability to reason, learn, analyze and explain data and knowledge is known as intelligent ability. Basically, an agent must possess four basic characteristics:

- Autonomy
- Reactivity
- Pro-activeness
- Scalability

Multi- Agent System (MAS):

Multi-Agent System consists of multiple interacting intelligent agents. It is used to solve difficult and impossible problems which cannot be done by individual agents. The advantages of Multi-agent system over distributed data mining system are: (i) agent's autonomy (ii) agent's go-aheadism (iii) agent's self-adaptation (iv) agent's coordination (v) agent's integration (vi) agent's mobility (vii) agent's assistance.

Integrating Data Mining, Expert Systems, and Intelligent Agents:

Intelligent techniques along with Intelligent agents, data mining models, and expert systems are used to solve difficult problems. But still there exist obvious differences among these three

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International Journal of Current Research and Academic Review

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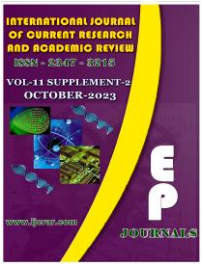

approaches. As for data mining, the main task is to provide or apply induction to build models to generalize data. Expert systems also build such generalized models, but these models are constructed by extracting knowledge from human experts. Both Intelligent agents and data mining models are similar because both share the ability to learn from its environment. And both differ in which Intelligent agents are goal directed whereas data mining models are used for testing purpose and to create new hypotheses about data.

Nextly, Intelligent agents and expert systems have at least three differences. Firstly, an expert system have general problem-solving knowledge, but the intelligent agent knowledge is personalized. Secondly, expert systems passively responds to questions where an intelligent agent acts on its own with the help of sensing information that it gets from an environment. Finally, intelligent agents carry out everyday tasks whereas expert systems perform high-level information in specialized domain. Since all the three approaches are different these three approaches has to be used together to build models to solve difficult problems. Let us combine these three approaches to build an automated system to perform supervised data mining.

If the results are not acceptable, the agent decides on one or more of the following actions:

- Invoke the parameter selector to make suggestions for resetting model parameter values
- Choose a new data mining model
- Modify the selection of input attributes
- Conclude that the domain is not amenable for data mining

JADE:

JADE is a middleware developed by TILAB. It is a software framework fully implemented in Java language to simplify the development of applications. Using a middleware it simplifies the implementation of MAS, the middleware complies with the FIPA (Foundation for Intelligent Physical Agents) specifications and a set of graphical tools which support the debugging and deployment phases. Such a system can be implemented with the help of JADE.

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International Journal of Current Research and Academic Review

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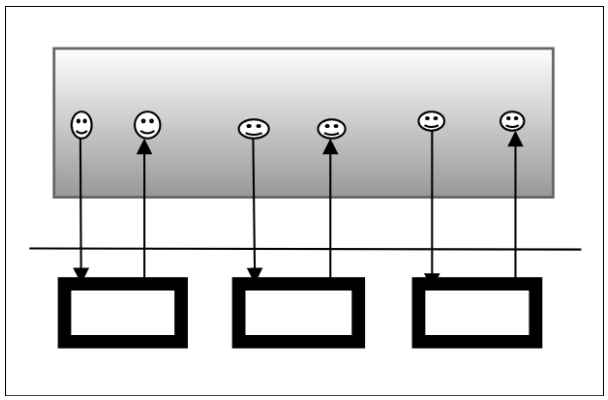

Jade Architecture

System Architecture:

Architecture includes a diagrammatic representation, in which data are partitioned based on K-Means algorithm. The diagram consists of a global memory which is central, a cluster head and various different databases. The work is implemented in JADE. The data are filled using pseudo entries which is related to the data that is used in a data warehouse of a supermarket. In this clustering of the database, the databases are managed in such a way the responsibility of finding a frequent k item set that is distributed over clusters which will increase the response time as well as it will decrease the number of messages should be given and therefore it will avoid the bottleneck around the central site. Inorder to solve the problem of optimizing the association rule, and to learn in data warehouses the following architecture is proposed.

K-Means Algorithm:

The k-means algorithm is a simple iterative method inorder to partition a given dataset into a user specified number of clusters, k. This algorithm has been discovered by several researchers across different disciplines, most notably Lloyd (1957, 1982) [24], Forgey (1965), Friedman and Rubin (1967), and McQueen (1967). A detailed history of k-means along with descriptions of various variations are given in [25]. Gray and Neuhoff [26] provide a nice historical background for k-means placed in the larger context of hill-climbing algorithms.The algorithm operates on a set of

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International Journal of Current Research and Academic Review

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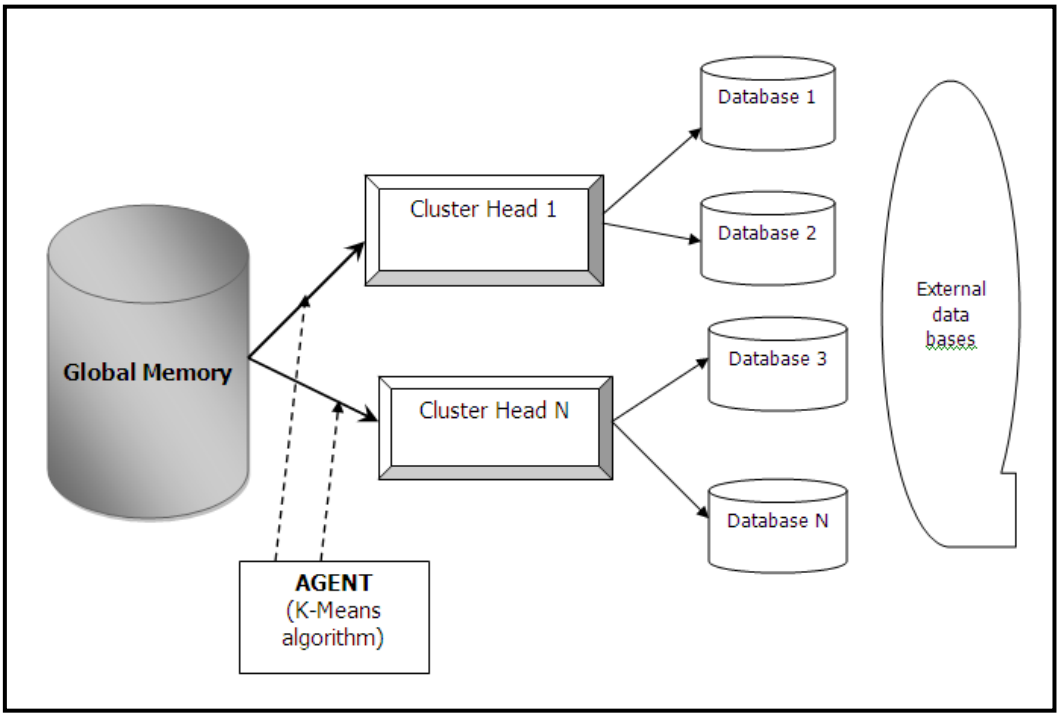
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

d-dimensional vectors, D = {xi | I = 1, . . . , N}, where xi denotes the ith data point. The algorithm is initialized by picking k points in data point as the initial k cluster representatives or "centroids". Techniques for selecting these initial seeds include sampling at random from the dataset, setting them as the solution of clustering a small subset of the data or perturbing the global mean of the data k times.



System Architecture

Conclusion

A new data mining method to mine rules from multi-relational databases is introduced in this paper. This behavior of our algorithm made it efficient in terms of communication overhead, message passing requires only one round and to aggregate reduction operation only one reduction operation is used. The model of global frequent itemsets which our algorithm generates are totally accurate and we prove it, this ensures privacy on the communication sites and hence

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International Journal of Current Research and Academic Review

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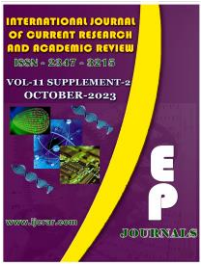

proved to be an efficient mechanism. It also behaves as an upperbound for the amout of necessary communication. This mechanism can be applied to real world databases with large volumes of data in future and it can also be combined with the fuzzy logic technology to predict data.

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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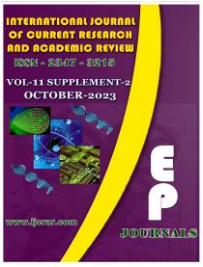

Full Length Article **IJCRAR/FL/100**

Review Article: Cardiospermum halicacabum

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Abstract

Though several studies reported the phytochemicals content and pharmacological activities of C. halicacabum, no review was undertaken to critically analyze these studies and propose the future research prospects of this plant as a cradle of novel drug candidates and as a functional food.. Moreover, there is no comprehensive study on the link between the traditional uses and scientifically verified pharmacological activities of C. halicacabum. Therefore, this review critically encapsulates the botanical description, geographical distribution, ethnomedical applications, phytochemistry, pharmacological activity, micropropagation and toxicity of C. halicacabum along with the research gaps for potential future investigations.

Keywords: *Cardiospermum halicacabum*, dasapushpam, climbing plant, Barbuda, Barbados, Dominica.

Introduction

Cardiospermum halicacabum, known as the lesser balloon vine, balloon plant or love in a puff, is a climbing plant widely distributed across tropical and subtropical areas of Africa, Australia, and North America that is often found as a weed along roads and rivers. (Pettit Drew, 2016) The 1889 book 'The Useful Native Plants of Australia' records that other common names for *Cardiospermum halicacabum* were "Heart seed", "heart pea", or "winter cherry". It is one among the "Ten Sacred Flowers of Kerala", collectively known as dasapushpam. " Plants Profile for *Cardiospermum halicacabum* (balloon vine)". (Plants.usda.gov. Retrieved 2019-05-29.) J. H. Maiden (1889). There are eight synonyms are available for *Cardiospermum halicacabum*, including *Cardiospermum*

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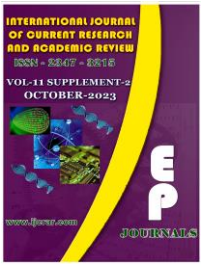

corycodes Kunze, *Cardiospermum glabrum* Schum. Thonn, *Cardiospermum halicacabum luridum* (Bl.) Adelb., *Cardiospermum. Luridum* Bl., *Cardiospermum microspermum* E. Mey., *Cardiospermum truncatum* A. Rich., *Corindum halicacabum* Medic., *Rhodiola biternata* Lour. (da Cunha Neto *et al.,* 2017; *Cardiospermum halicacabum* Linn, 2021).

The specific epithet halicacabum comes from the Greek word for salt barrel and refers to the inflated fruits, after which the common name balloon vine is derived. Halicacabum is a common plant in tropical and subtropical regions throughout the world. It is widespread in South Africa and North American countries (Antigua and Barbuda, Barbados, Dominica, Grenada, Guadeloupe, Martinique, Montserrat, Netherlands Antilles, Saint Kitts, and Nevis, Saint Lucia, Saint Vincent, and the Grenadines). (Johnston *et al.,* 1979).

C. halicacabum is a slender herbaceous, more or less hairy plant (Fig. 1) and habitually categorized as a cosmopolitan species with an extensive distribution. The vernacular names of *C. halicacabum* in different countries. It is not only popular as a healthy green vegetable in rural areas but also in the townships of southern India.

Though this plant has been used for the ornamental purpose in some countries, it is mainly used as a medicinal plant in India. The leaves and stems from this plant have been used in Tamil cuisine for preparing curries, lentil crepes, decoctions, sauces, herb purees, and vegetable soups as part of a healthy diet. (Zalke *et al.,* 2013).

C. halicacabum imparts an energizing effect, a nutty flavor, and delectable touch to soups, and thus, it is highly valued in Indian cuisine. Most importantly, *C. halicacabum* has been used in popular medicinal practices like Siddha, Ayurvedic, Unani, and Indian folk medicine in the treatment of rheumatism, lumbago, cough, hyperthermia, nervous diseases, snake bite, stiffness of limbs, and earache.

It is also used as a demulcent in the cases of orchitis and dropsy (Zalke *et al.,* 2013). Interestingly, many in vitro and in vivo studies on *C. halicacabum* have revealed its pharmacological properties including anti-inflammatory, anti-arthritic, antioxidant, anticancer, antimicrobial, anti-ulcer, neuroprotective, analgesic, anxiolytic, nephroprotective an antidiabetic activities. (Raza et 2013.)

EXCELLENT PUBLISHERS

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Journal home page: http://www.ijcrar.com

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Fig.1

The morphological characteristics of the plant are the preconditions for the scientific denomination. From Latin, "cardiospermum" means heart-shaped seed, while "halicacabum" means container for salt. In the German language, the plant is known as "herzsamen"; in Tamil it is known as "Modakathon", i.e. disabling pain and remedy; in North America it is referred to as "balloonvine" (that is, climbing balloon) due to the fact that the plant is a creeper and produces globose capsules similar to small balloons. In the middle of the last century, Willmar Schwabe picked up this plant in Africa, where it was popularly used as a medicine for various applications: as an anti-rheumatic, for digestive and respiratory disorders, joint pain, back pain, sprains, muscle tears, and inflammation. Over a period of 70 years, the cortisonic effects of this plant were discovered.2 Subsequently, the plant was the subject of study by many researchers who were driven by the importance it had among poor populations and experimentally highlighted its phytotherapeutic properties. In rural areas of southern India, this plant is sold in local markets as a green vegetable and provides a source of income for poor families. The whole plant has been used for several centuries in the treatment of rheumatism, stiffness of the limbs, and snake bite; the decoction from its roots is used as a diaphoretic, diuretic, emetic, laxative, and for sweating; the decoction of its leaves and stems is used in cases of diarrhea, dysentery, and headaches; a poultice of them as a cure for swelling. The juice of the leaves has even been used as a treatment for earache.3-5Due to the presence of saponins, substances that for a foam in water when they undergo agitation, *C. halicacabum* is used in its regions of origin as a detergent for the hair and as a laundry soap. Every part of this plant is useful, as food and as a remedy for diseases.(Chopra *et al.*, 1986)

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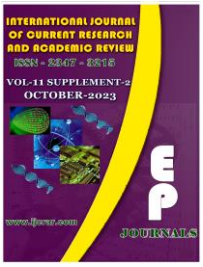

Scientific classification

a) Kingdom: Plantae
b) Order: Sapindales
c) Family: Sapindaceae
d) Subfamily: Sapindoideae
e) Genus: Cardiospermum
f) Species: C. halicacabum

Therapeutic uses

C. halicacabum shows various medicinal properties such as antibacterial, antifungal, antiparasitic, antidiarrhoeal, anxiolytic, rubefacient, antipyretic, anti- inflammatory, anticonvulsant, and anticarcinogenic. Earache can be treated by using leaves juice as eardrop. It enhances hair growth. Leaves of C. halicacabum are used to treat scalp. The extract is a good herbal treatment for skin redness. It acts as modulators in reactions. This gives antipruritic properties. This plant does not forms hematoma hence, can be used for long term. It is effective in neurodermatitis like illness in chronic stages cardiac glycosides found in small quantities in the extracts (Deepan *et al.*, 2012). It also inhibits the action of drugs. Hence, it acts as immunosuppressive. Various skin problem as well as eczema can also be treated by the extract. Root extract are also used. Roots give quick remedy to pain, swelling, arthritis, body ache. Diarrhoea can also be treated by consuming leaves of this plant. Extract of roots are useful to cure hemorrhoids. Herbal tea can also be prepared.

Medicinal properties and uses

C. halicacabum works as diaphoretic, diuretic, emetic, laxative, refrigerant, stomachic and sudorific and has antibacterial, anti-diarrheal, antioxidant activities, suppresses TNF production, exhibits anticancer, vaso depressant effect, rheumatism, severe bronchitis, snakebite. The sap of this plant is used for preparing a wash which is applied to the eyes to treat conjunctivitis. The stem of this plant is used locally to treat cuts, bruises, sprains, swellings, and warts. The leaves of the plant are chewed to relieve mouth sores. Antiulcer, analgesic, antiparasitic, antimalarial, antifilarial, and antipyretic (Raman *et al.*, 1998; Rao *et al.*, 2006; Kumaran and Karunakaran, 2006; Babu and

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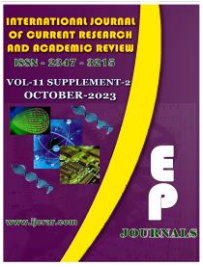
International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Krishnakumari, 2006; Sheeba and Asha, 2006; Gopalakrishnan *et al.,* 1976; Asha and Pushpangadan, 1999).

Antibacterial activity

C. halicacabum extract shown antimicrobial activity against the pathogens viz. *Escherichia coli, Pseudomonas aeruginosa,* and *Streptococcus* sp. (Gopal *et al.,* 2014).

Antipyretic activity

C. halicacabum exhibited antipyretic activity against yeast-induced pyrexia in rats (Asha and Ushpangadan, 1999).

Antifungal activity

The herbal extracts have shown inhibition against the fungi. Mahmud *et al.,* 2009 reported that the extract of *C. halicacabum* L. shown antifungal activity against human pathogens (*Aspergilla's niger, Candida albicans*), animal pathogens (*Microsporillum gypsiccus, Trichophyton mentagrophyte*) and plant pathogens (*Saccharomyces cerevisiae, Penicillium* sp.) (Shareef *et al.,* 2012).

Antioxidant activity

Methanol extract of *C. halicacabum* shown antioxidant potential in vitro systems. The extract of *C. halicacabum* indicates that it has good potential as a source for natural antioxidants. This prevent it from free radical-mediated oxidative damage (Joshi *et al.,* 2017).

Antidiabetic activity

Antidiabetic effect of *C. halicacabum* ethanolic extract against streptozotocin- induced diabetic rats shown good activity. Many flavonoids present in the extract. These flavonoids reported as the antidiabetic principles. The leaf extract of *C. halicacabum* help to increase the activity of glucokinase and decrease the activity of glucose 6-phosphatase and fructose 1,6 phosphatase in the liver (Rajeswari and Sriidevi, 2014).

EXCELLENT PUBLISHERS

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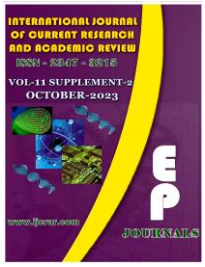

Antiarthritic activity

A topical herbal gel formulated by *C. halicacabum* and *Vitex negundo,* which shown promising results for the treatment of arthritis (Rajasekaran *et al.,* 2016).

Anticovulsant activity

Petroleum ether fraction of *C. halicacabum* shown anticovulsant activity against electroshock induced convulsions in rats (Vetrichelvan *et al.,* 2000).

Anti-inflammatory activity

Ethanolic extract of possess good anti-inflammatory activity against mouse macrophage cell line RAW264.7 (Sheeba and Asha, 2009).

Antiparasitic activity

Extracts of *C. halicacabum* tested against third-stage larvae of Strongyloides stercoralis. Aqueous extract of *C. halicacabum* exerted more rapid effect on larval motility than that of the alcoholic extract (Boonmars *et al.,* 2005).

Anticancer activity

The presence of phytocompounds, the extract of *C. halicacabum* showed anticancer activity against the breast cancer cell lines MCF-7 (Sagadevan *et al.,* 2013).

Antimalarial activity

The Ethyl acetate extracts showed limited in vitro antimalarial activity, not sufficient to warrant further investigation. The extracts showed similar activity against chloroquine-sensitive D10 and the chloroquine and sulphonamide resistant KI parasites.(Funct.Foods2018)

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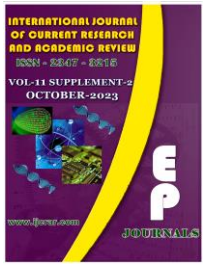

Antiulceral activity

Ethanol extract of *Cardiospermum halicacahum* Linn. (Sapindaceae), in a concentration dependant manner (200 600) mg/kg) inhibited gastric ulcers induced by oral administration of absolute Ethanol. Further, the extract administration to rats resulted in an increase in levels of gastric glutathione and a decrease in alkaline phosphatase activity. The *n* extract also exhibited potent in vitro hydroxyl radical scavenging and inhibition of lipid peroxidation activities. The extract was found to be devoid of any conspicuous acute and short-term toxicity in rats.(.Phytomedicine 20114)

Anti-arthritic activity

Inflammatory diseases including different types of rheumatic diseases are a major cause of morbidity of the working force throughout world. This has been called the 'King of Human Miseries23.The anti-arthritic effect of oral administration of ethanolic extract of *Cardiospermum halicacabam* leaves (CEE) at the dose of 125 mg/kg and 250 mg/kg on Freund's complete adjuvant (FCA) induced arthritis has been studied in rats. The treatment is assessed by measuring the paw volume and by using various hematological parameters like hemoglobin) content, total red blood cell (RBC) count, white blood cell (WBC) count and erythrocyte sedimentation rate (ESR).The investigated result showed that the extract inhibited the FCA induced arthritis in a dose dependent manner and this effect was more significant with 250 mg/kg dose. Administration of extract improved the body weight significantly when compared to FCA induced arthritis rats.The results were compared to that of Indomethacin. The results suggest that the ethanolic extract of *Cardiospermum halicacabum* leaves exhibits significant anti- arthritic effect.(Rajasekaran *et al.,* 2016).

Antianxiety activity

Antianxiety effects of alcoholic and aqueous root extracts of *Cardiospermum halicacabum* in mice are studied. Mice were treated with the alcoholic or aqueous extract 1 hr before subjecting the animals to various anxiety models. Anti anxiety activity was evaluated using elevated plus maze (EPM), light-dark model (LDM) and open field test (OFT).in EPM, treatment with alcoholic and aqueous extracts increased the time spent in open arm and total locomotion time. In light dark model treatment with these extracts showed increase in time spent in light compartment and in

EXCELLENT PUBLISHERS

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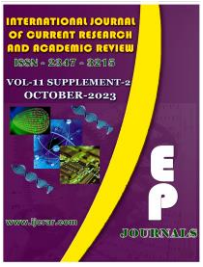
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



Open field test treatment with these extracts increased the time spent in central compartment. These results suggest that alcoholic and aqueous extracts of *Cardiospermum halicacahum* possess antianxiety activity, (12;.51Vetrichelvan *et al.,* 2000).

Neuroprotective role

Methanolic extract of *C. halicacabum* potentially improved memory. It also significantly decreased the whole brain acetyl cholinesterase activity. Dementia is a type of neuro disease in which progressive brain dysfunctions that leads to (Kukkar *et al.,* 2014).

Conclusion

From the above review its concluded that *C. halicacabum* showed significant pharmacological activity. Further more investigation may reveal enhanced potentials of the plant.

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

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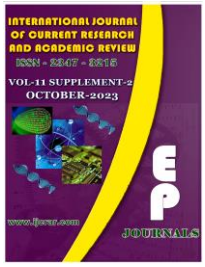

Full Length Article **IJCRAR/FL/101**

Machine Learning Project

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Abstract

The issue of creating computers that learn automatically through use is addressed by machine learning. The convergence of computer science and statistics, as well as the foundation of artificial intelligence and data science, make it one of the technical domains with the fastest growth rates today. Machine learning has advanced recently as a result of the creation of new learning theories and algorithms as well as the continual explosion in the accessibility of online data and low-cost processing. Science, technology, and business have all adopted data-intensive machine-learning techniques, which has increased the use of evidence-based judgment in numerous fields such as marketing, manufacturing, health care, and financial modeling.

Keywords: Machine Learning, foundation of Artificial Intelligence, Data Science, fastest growth rates, creating new learning theories and algorithm.

Introduction

A branch of artificial intelligence called machine learning includes creating algorithms and statistical models that let computers learn from experience and become better at completing tasks. These models and algorithms are built to learn from data and forecast or decide without being given specific instructions. Machine learning comes in a variety of forms, such as reinforcement learning, unsupervised learning, and supervised learning. In contrast to unsupervised learning, which uses unlabeled data, supervised learning involves training a model using labeled data.

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International Journal of Current Research and Academic Review

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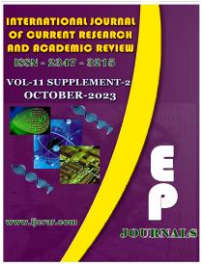

Through trial and error, a model is trained throughreinforcement learning. Natural language processing, recommender systems, picture and audio recognition, and other fields all make use of machine learning.

Machine learning to find different patterns in a dataset. It can automatically get better by learning from previous data. Data is what drives this technology. Data mining and machine learning share many similarities because they both work with vast amounts of data.

Literature Review

Batta Mahesh [1] Explained that The study of algorithms and statistical models that computer systems employ to carry out a particular task without being explicitly taught is known as machine learning (ML). There are several daily-used programs that incorporate learning algorithms. One of the reasons an online search engine like Google works so well every time it is used to search the internet is because a learning algorithm that has mastered the art of ranking websites.

M. I. Jordan, *et al.,* [2] Concluded that the issue of creating computers that learn automatically through use is addressed by machine learning. It is one of the technical domains with the fastest rate of growth in the modern era, straddling the boundaries of artificial intelligence and data science as well as computer science and statistics.

Zhi –Hua Zhou [3] described that we suggest learning software. A learnware is a well-performing pre-trained machine learning model with a specification that specifies the model's goal and/or area of expertise. A learnware should have at least three key characteristics: it should be reusable, adaptable, and understandable.

Taiwo Oladipupo Ayodele [4] justified that machine learning algorithms are organized into taxonomy, based on the desired outcome of the algorithm. Common algorithm types include: Supervised learning, Unsupervised learning, Reinforcement learning

Kiri L. Wagstaff [5] Acknowledged the relationship between contemporary machine learning (ML) research and issues important to the greater field of science and society has largely been

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International Journal of Current Research and Academic Review

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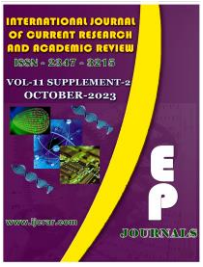
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15



lost. According to this viewpoint, there are evident limits in the data sets we examine, the assessment criteria we use, and the extent to which outcomes are shared with their original domains.

Suvrit Sra, etal [6] elucidate that optimization approaches have enjoyed prominence in machine learning because of their wide applicability and attractive theoretical properties. While techniques proposed twenty years and more ago continue to be refined, the increased complexity, size, and variety of today's machine learning models demand a principled reassessment of existing assumptions and techniques. This book makes a start toward such a reassessment.

Foster Provost, *et al.,* [7] Explained that much of the science of Machine Learning is a science of engineering.1 By this we mean that it is dedicated to creating and compiling variable knowledge related to the design and construction of artifacts. The scientific knowledge comprises theoretical arguments, observational categorizations, empirical studies, and practical demonstrations. The artifacts are computer programs that use data to build models that are practically or theoretically useful

Xiao gang Wang [8] Explained the basics of Machine learning such as Training, Classification, Regression, Optimization, Generalization, capacity, overfitting, Underfitting, Optimal Capacity, Regularization

Tom M. Mitchell [9] The goal is to present the key algorithms and theory that form the core of machine learning. Machine learning draws on concepts and results from many fields, including statistics, artificial intelligence, philosophy, information theory, biology, cognitive science, computational complexity, and control theory

P. P. Shinde, *et al.,* [10] The Author explains the Machine Learning and its subset deep learning features that is applied in plenty of technologies across the World

Machine Learning Work Processing

When a machine learning system receives new data, it creates prediction models, gains knowledge from the past, and forecasts the results. The volume of data contributes to the

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International Journal of Current Research and Academic Review

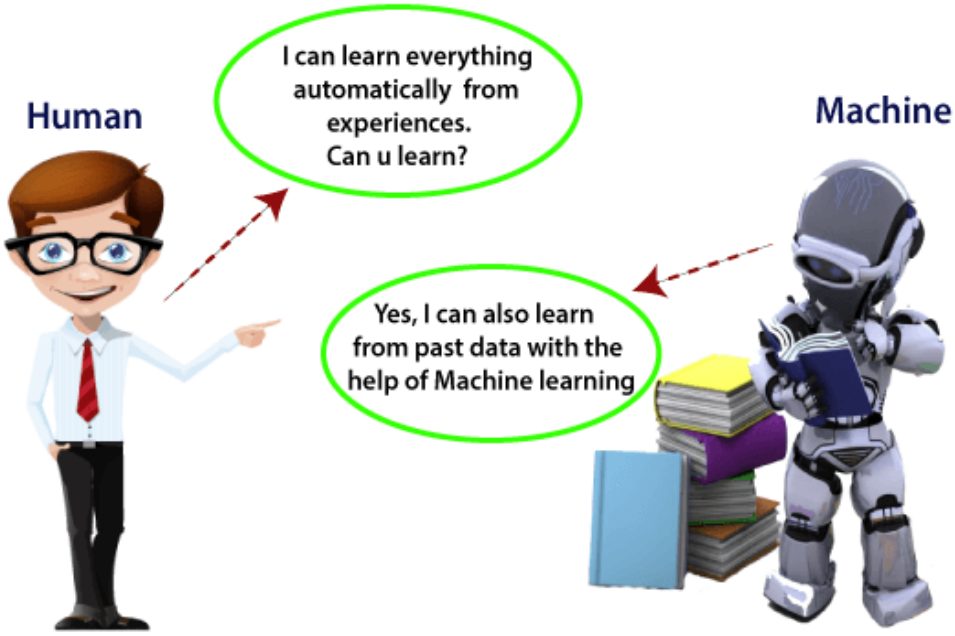
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

development of a more accurate model that predicts the outcome, which in turn influences the accuracy of the projected outcome.

Fig.1 Visual Representation of Machine Learning



Features of Machine Learning

Data is used by machine learning to find different patterns in a dataset.It can automatically get better by learning from previous data. Data is what drives this technology. Data mining and machine learning are quite similar because both processes work with vast amounts of data.

Algorithms for Machine Learning

Machine learning algorithms are the types of software that can autonomously forecast results, discover hidden patterns in data, and enhance performance. Machine learning allows the use of

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

several algorithms for various tasks, like the KNN method for classification issues and simple linear regression for prediction issues like stock market forecasting.

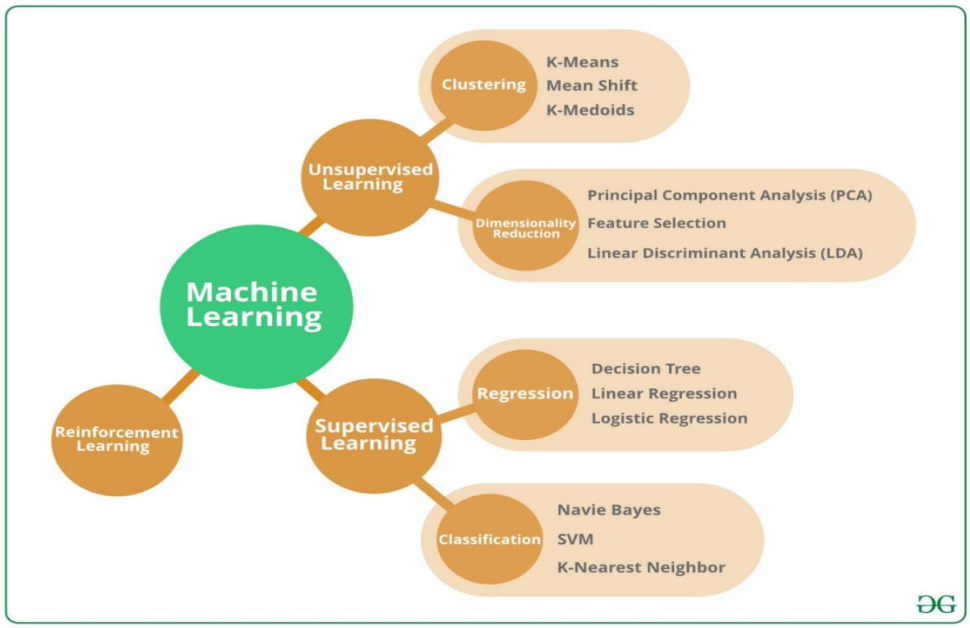
The overview of a few well-known and widely applied machine learning algorithms, as well as their use cases and classifications, are covered in this article.

Types of Machine Learning Algorithms

Machine Learning Algorithm can be broadly classified into three types:

- Supervised Learning Algorithms
- Unsupervised Learning Algorithms
- Reinforcement Learning algorithm

Fig.2 Different ML Algorithm and its Categories



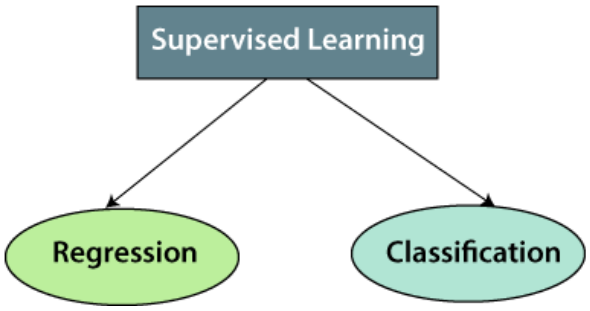
International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

Supervised Learning

A type of machine learning called supervised learning requires outside supervision for the machine to learn. The labeled dataset is used to train the supervised learning models. After training and processing, the model is put to the test by being given a sample set of test data to see if it predicts the desired result.In supervised learning, mapping input and output data is the main objective. It is the same as when a student is studying under the teacher's supervision because supervised learning is dependent on supervision. Spam filtering is a prime example of supervised learning.

Problems with supervised learning can be further separated into two categories

Fig.3 Problems of Supervised Learning



Simple linear regression, decision trees, logistic regression, the KNN method, and others are prominent supervised learning algorithms.

Unsupervised Learning

Unsupervised learning is a sort of machine learning where the computer can make its own decisions based solely on the data it is given. The algorithm needs to act on that data without any supervision, and the unsupervised models can be trained using the unlabeled dataset, which is neither classed nor categorized. In unsupervised learning, the model searches through the vast amount of data in search of meaningful insights rather than producing a predetermined result.

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

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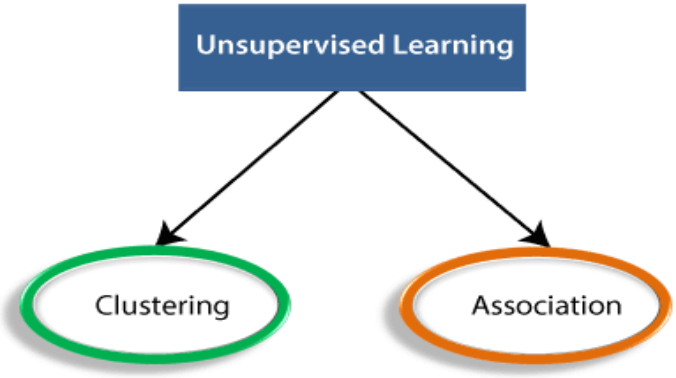
Journal home page: http://www.ijcrar.com

INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

These are employed in order to address the Association and Clustering issues. Consequently, it can be divided into two categories

Fig.4 Unsupervised Categories



K-means Clustering, Apriori Algorithm, Eclat, and other algorithms are examples of certain unsupervised learning methods.

Reinforcement learning

In reinforcement learning, an agent produces actions to interact with its environment and learns from feedback. The agent receives feedback in the form of rewards; for example, he receives a positive reward for each good activity and a negative reward for each bad action. The agent is not under any oversight. Reinforcement learning makes use of the Q-Learning algorithm.

List of Popular Machine Learning Algorithm

- Linear Regression Algorithm
- Logistic Regression Algorithm
- Decision Tree

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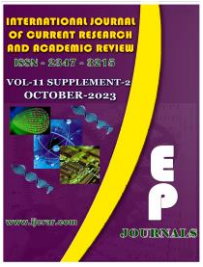

- SVM
- Naïve Bayes
- KNN
- K-Means Clustering
- Random Forest
- Apriori
- PCA

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EXCELLENT PUBLISHERS

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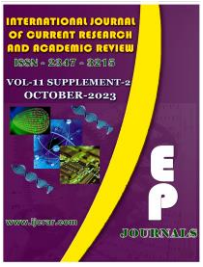

Full Length Article **IJCRAR/FL/102**

How Can AI Automate End-To-End Data

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Abstract

Data science is labor-intensive and human experts are scarce but heavily involved in every aspect of it. This makes data science time consuming and restricted to experts with the resulting quality heavily dependent on their experience and skills. To make data science more accessible and scalable, we need its democratization. Automated Data Science (Au- to DS) is aimed towards that goal and is emerging as an important research and business topic. We introduce and define the Auto DS challenge, followed by a proposal of a general Auto DS frame- work that covers existing approaches but also pro- vides guidance for the development of new methods. We categorize and review the existing literature from multiple aspects of the problem setup and employed techniques. Then we provide several views on how AI could succeed in automating end- to-end. We hope this survey can serve as insightful guideline for the Auto DS field and provide inspiration for future research.

Keywords: Data analysis, data mining, AI ops, Data Ops, Artificial Intelligence.

Introduction

Data science covers the whole spectrum of data processing, beginning from data integration, distributed architecture, automating machine learning, data visualization, dashboards and BI, data engineering, deployment in production mode, and automated and data-driven decisions A key part of data science is machine learning in which the system learns from data-driven examples in order to make predictions about examples in which some of the attributes are miss

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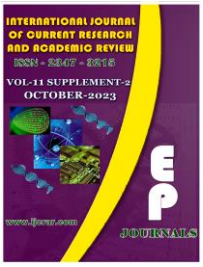

ing. In supervised learning, this process of modeling uses fully specified examples, referred to as training data, whereas in unsupervised learning, this process is done with incompletely specified examples. Beyond these core areas, many parts of data science such as data acquisition, data integration, and data visualization (which are traditionally not considered machine learning) are essential to the effective deployment of data science and machine learning solutions.

Much of data science requires manual intervention in the form of the choice of software (and its set up) and the overall learning pipeline; this makes the use of available resources over diverse settings very challenging. For example, machine learning often requires significant manual exploration of the input data before the data science pipelines are experimented for various tasks. This is a time consuming task, and is of- ten the primary bottleneck in the ad hoc effort required from the analyst.

Given a set of machine learning tools and a set of problems, how does one choose what type of resource to deploy in a particular setting? How does one decide how to set its parameters? When training has been performed with a particular data set, how does one decide that the constructed model has now become stale? All these questions often require manual intervention from a user who must experiment with various settings in trial-and-error mode, until decisions on deployment have been made. This type of situation militates against the successful use of wide resources over many settings.

The challenges in automating data science may arise at in dividual stages of the pipeline, or in the construction of the entire pipeline itself. Furthermore, each stage in the pipeline poses its own set of unique challenges – for example, challenges in the data integration stage are quite different from those in the machine learning stage. We will discuss these challenges in the context of automated data science solutions.

Rather than an exhaustive survey, our purpose in this paper is mainly to provide a qualitative overview and editorial out- look for the topic of end-to-end automation of data science. We begin by describing what artificial intelligence (AI) currently automates in the parts of the data science pipeline, then highlight some general approaches that could address the en tire process more holistically

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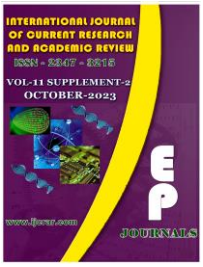

What Does AI Automate Today?

Although the goal of end-to-end automated data science is still quite far, many parts of the data science pipeline have been automated with significant success. Here we provide a broad overview of many such cases.

Automated Data Collection

Data engineering is the aspect of data science that focuses on the *ground truth gathering* step with the focus on data collection and analysis. For all the questions that data scientists answer using large data sets, there have to be mechanisms for collecting and validating those relevant information. In this context, much of modern hardware technology has already automated data collection; simple transactions today such as phone usage or credit card swipes lead to data collec tion behind the scenes. The real issue is that there is a *cost* in even using the data collected unless there are ways of parsing out parts of the data relevant and useful for the application at hand. The field of *active learning* [Aggarwal *et al.,* 2014] provides methods capable of selectively collecting appropri ate and relevant data for a particular application. This process integrates data collection and knowledge discovery, and auto mates large parts of the process to minimize manual effort.

Automated Data Integration

The process of integrating data from heterogeneous sources into a single, unified view has been a significant barrier to many data science tasks a variety of infrastructures generate different data formats with varying levels of contamination in the raw data. This necessitates custom ETL (Ex- tract, Transform, Load) code for *data cleaning and integration*.

This process has been automated with a declarative interface [Kougka *et al.,* 2018] allowing for extendable domain- specific data models; a AI planner performs the integration, optimizing for the plan completion time. This tool is designed for schema-less data querying, code reuse within specific do- mains, and is robust to messy unstructured data, demonstrated by its capability of integrating data from diverse sources such as web click-stream logs and the census. However, the application of such data cleaning and integration tools have been relatively limited, and there is

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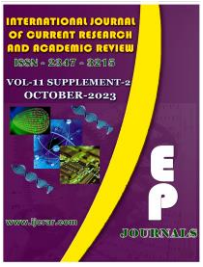

various open research challenges to wider automation. For example, for any given set of data sources, a truly autonomous system should be able to automatically detect the nature of the data and the ETL steps required for the application at hand

Automated Machine Learning

Automated Machine learning (AutoML) has received in- creasing attention, starting with hyper-parameter optimization (HPO) to determine the most appropriate parameters for a ML model (for example, the number of trees in a random forest), to automating selection of a ML pipeline (such as feature transformation & selection combined with predictive modeling). AutoML automates the *model selection*, *(hyper) parameter optimization*, and even *ensembling* steps of the data science workflow, addressing a wide range of difficult technical challenges ranging from HPO, automated feature engineering, to neural network design. The neural network paradigm has itself been a fillip to the development of auto- mated data science by enabling automated feature engineer- ing to a large extent, and has provided successful end-to-end solutions in specific domains like machine translation [Wu *et al.,* 2016] which traditionally relied on large amounts of hand-crafted features. Nevertheless, the move to fully automated systems has been incomplete because they continue to require human-centric tuning of large numbers of parameters or design choices. AutoML bridges this additional gap to a large extent; in addition, newer technologies such as reinforcement learning can play a significant role. Auto- WEKA [Thornton *et al.,* 2012] and Autosklearn [Feurer *et al.*, 2015] are the main representatives for solving Au- to ML by so-called sequential parameter optimization. Both apply Bayesian Optimization to find useful ML pipelines. Autosklearn improves upon Auto-WEKA by utilizing *meta- learning* [Vanschoren, 2018] and *ensembling*.

Visualizations and Decision Making

At the end of the day, the results of machine learning are often fed into visualization and/or decision making tools. This is a particularly tricky part of the process, since the nature of the visualizations and decisions are highly application-specific. This makes automation less feasible. Nevertheless, progress has been made in some partial respects. Much of what AI automates today remain as parts of the data science pipeline. However, to be able to work from raw sensory inputs

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International Journal of Current Research and Academic Review

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Journal home page: http://www.ijcrar.com

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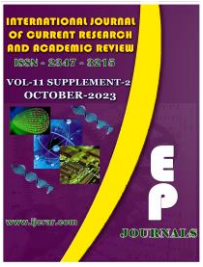

to final decisions is a key challenge that is required for a high level of automation. This forms the basic goal of *end-to-end* data science, as opposed to the automation of individual parts of the data science process, discussed in the previous sections. Here we highlight general frameworks and approaches which offer possible avenues for considering more holistic automation.

Reinforcement Learning

The main challenge that arises in building fully automated systems at the level of humans is the fact that the construction of a machine learning system requires a large number of design choices, and the specific *combination* of these de- sign choices can regulate the effectiveness of the system at hand. In many cases, these decisions need to be made *sequentially*. For example, if one is to construct a neural net- work for a particular task, then the choice of the number of layers naturally precedes the choice of the number of units in each layer. Humans are naturally prone to experiment- ing with these large numbers of decision choices, and are often able to construct a reasonably accurate system with a relatively modest number of iterations of trial and error. Therefore, creating systems that *automatically perform trial and error, and learn from successes and failures is the key to creating a truly intelligent automated system.* This type of setting is naturally the domain of *reinforcement learn- ing* in which a system can learn from the success and failure of trials [Sutton and Barto, 1998]. Reinforcement learn- ing is used extensively for video games [Mnih *et al.,* 2013; Noothigattu *et al.,* 2019], in which one makes a set of sequential decisions in order to win virtual rewards in the form of game points or victories, and the success of a particular set of decisions can be easily judged. It is noteworthy that many of these solutions work with raw sensory inputs (e.g., pixels) and provide the final decisions as the result, which is a high level of end-to-end automation.

Deep Learning

The problem of Automated Deep Learning (ADL) boils down to designing a strategy that given a dataset and a task along with some constraints, yields a well-trained deep learning model that can be used for solving the task. Designing an optimizer that given a search space, looks for an optimal architecture, forms the key component of ADL methods. The cur rent trends in ADL methods explore a variety of approaches to solve this optimization problem, most of which build

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International Journal of Current Research and Academic Review

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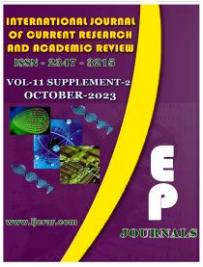

upon the well established theories in reinforcement learning (RL) and evolutionary algorithms (EA). It should come as no surprise that both of these ideas borrow heavily from the success of the biological paradigm.

Conclusion

Data science education is well into its formative stages of development; it is evolving into a self-supporting discipline and producing professionals with distinct and complementary skills relative to professionals in the computer, information, and statistical sciences. However, regardless of its potential eventual disciplinary status, the evidence points to robust growth of data science education that will indelibly shape the undergraduate students of the future. In fact, fueled by growing student interest and industry demand, data science education will likely become a staple of the undergraduate experience.

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International Journal of Current Research and Academic Review

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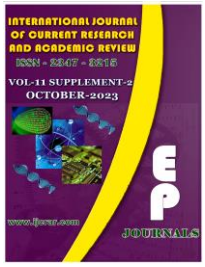

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International Journal of Current Research and Academic Review

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Journal home page: http://www.ijcrar.com

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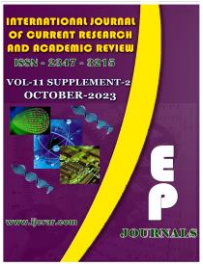

Full Length Article **IJCRAR/FL/103**

Prospects and Problems of Wireless Communication for Underwater Sensor Networks

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Abstract

This paper reviews the physical fundamentals and engineering implementations for efficient information exchange via wireless communication using physical waves as the carrier among nodes in an underwater sensor network (UWSN). The physical waves under discussion include sound, radio, and light. We first present the fundamental physics of different waves; then we discuss and compare the pros and cons for adopting different communication carriers (acoustic, radio, and optical) based on the fundamental first principles of physics and engineering practice. The discussions are mainly targeted at underwater sensor networks (UWSNs) with densely deployed nodes. Based on the comparison study, we make recommendations for the selection of communication carriers for UWSNs with engineering countermeasures that can possibly enhance the communication efficiency in specified underwater environments.

Keywords: Underwater sensor networks, wireless communication, acoustic waves, electromagnetic waves, optical waves.

Introduction

In the last several years, underwater sensor network (UWSN) has found an increasing use in a wide range of applications such as coastal surveillance systems, environmental research,

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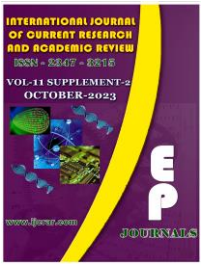

autonomous underwater vehicle (AUV) operation, to name a few [1–4]. By deploying a distributed and scalable sensor network in a three-dimensional underwater space, each underwater sensor can monitor and detect environmental parameters and events locally.

Hence, compared with remote sensing, UWSNs provide a better sensing and surveillance technology to acquire better data to understand the spatial and temporal complexities of underwater environments. Clearly, efficient underwater communication among units or nodes in a UWSN is one of the most fundamental and critical issues in the whole network system design. Present underwater communication systems involve the transmission of information in the form of sound electromagnetic (EM), or optical waves. Each of these techniques has advantages and limitations.

Communication Requirements for Underwater sensor networks

The UWSNs targeted by this paper are underwater networks with densely deployed sensor nodes. High node density is the key characteristic of such networks. Depending on the applications, we can roughly classify the targeted dense sensor networks into two categories: (1) UWSNs for long-term non-time critical aquatic monitoring applications (such as oceanographic data collection, pollution monitoring/detection, and offshore oil/gas field monitoring); (2) UWSNs for shortterm time-critical aquatic exploration applications (such as submarine detection, loss treasure discovery, and hurricane disaster recovery) [2]. The former category of UWSNs can be either mobile or static depending on the deployment of sensor nodes (buoyancy-controlled or fixed at sea floor), while the latter category of UWSNs is usually mobile since it is natural to imagine that the cost of deploying/recovering fixed sensor nodes is typically forbidden for shortterm time-critical applications.

To summarize, we will focus on three types of UWSNs: (1) mobile UWSNs for long-term non-time critical applications (M-LT-UWSNs for short); (2) static UWSNs for longterm non-time critical applications (S-LT-UWSNs for short); (3) mobile UWSNs for short-term time-critical applications (M-ST-UWSNs for short). Obviously, different types of UWSNs have different communication requirements. We summarize the communication requirements for all three types of UWSNs in Table I. Besides the UWSNs we discussed above, underwater networks also include

International Journal of Current Research and Academic Review
ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)
Journal home page: http://www.ijcrar.com
INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2021 - IJCRAR--ICV 2016: 81.15

sparse mobile AUV or unmanned underwater vehicle (UUV) networks, where vehicles/nodes can be spaced out by several kilometres. This type of networks has its unique communication requirements, and it is not the focus of this paper.

Fundamentals of Physical Waves as Underwater Communication Carriers

Understanding the first principles of each physical wave used in UWSN wireless communication is critically important. In this section we lay out the fundamental physical properties and critical issues for each of the acoustic, EM, and optical wave propagations in underwater environments. We discuss each physical carrier's advantages and disadvantages towards efficient underwater wireless communication.

Acoustic Waves

Among the three types of waves, acoustic waves are used as the primary carrier for underwater wireless communication systems due to the relatively low absorption in underwater environments. We start the discussion with the physical fundamentals and the implications of using acoustic waves as the wireless communication carrier in underwater environments.

Electromagnetic Waves

The use of EM waves in radio frequency band has several advantages over acoustic waves, mainly on faster velocity and high operating frequency (resulting in higher bandwidth). However, there are many limiting factors when using EM waves in water. In this section, we will first discuss the fundamental physical behavior of EM field in underwater environments.

Optical Waves

Using optical waves for communication obviously has a big advantage in data rate, that can potentially exceed 1 Giga bps. However, there are a couple of disadvantages for optical communication (OCOMM) in water. Firstly, optical signals are rapidly absorbed in water. Secondly, optical scattering caused by suspending particles and planktons is significant. Thirdly,

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ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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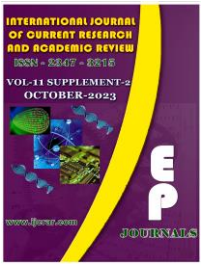

high level of ambient light in the upper part of the water column is another adverse effect for using OCOMM.

Engineering Counter measures

In this section, we describe the engineering countermeasures that have been developed to address the physical challenges for each wave used as the communication carrier in UWSNs. These are physical layer techniques to achieve point-to-point communication among sensor nodes.

Acoustic Communication (ACOMM)

Acoustic waves propagate well in seawater and can reach a far distance, as is the main reason why acoustic waves are widely used in underwater communication.

Electromagnetic Communication (EMCOMM)

The main challenge in using radio underwater is the severe attenuation due to the conducting nature of seawater. As a result, EMCOMM works in the power-limited region. Extremely low frequency (ELF) radio signals have been used in military applications. Germans pioneered EMCOMM in radio frequency for submarines during World War II, where the antenna was capable of outputting up to 1–2 Mega-Watt (MW) of power [38]. An ELF signal, typically around 80 Hz at much lower power, has been used to communicate with naval submarines globally today. This is possible mainly because most of the transmission paths are through the atmosphere [38].

Networking Challenges for Underwater Acoustic Sensor networks

In this section, we focus on the networking challenges for underwater acoustic sensor networks. Due to the unique characteristics of underwater acoustic channels (long latency and low bandwidth) and the harsh underwater environments (resulting in high channel dynamics), technology used in terrestrial radio networks could not be applied to underwater acoustic

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International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 11 Supplement 2 (October-2023)

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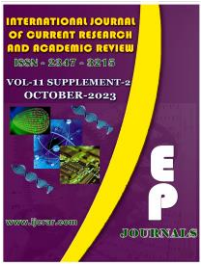

networks. Next we discuss several typical networking problems in the design of UWSNs. We identify the design challenges and brief some recent solutions in the literature.

Medium Access Control

Due to the dense deployment of sensors in UWSNs, we need to design an efficient medium access control (MAC) protocol to coordinate the communication among sensors. This is a largely unexplored challenge in the communication/networking community. On the one hand, there is no need for MAC protocols in existing small-scale acoustic networks, since in such networks, sensors are sparsely separated from each other, and point-to-point communication is sufficient.

Multi-Hop Routing

Forwarding data from source nodes to command/control stations efficiently is very challenging in UWSNs, especially in mobile UWSNs for longterm applications. In such networks, saving energy is a major concern. At the same time, routing should be able to handle node mobility. This requirement makes most existing energy-efficient routing protocols unsuitable for UWSNs. There are many routing protocols proposed for terrestrial sensor networks, such as Directed Diffusion [53], and Two-Tier Data Dissemination (TTDD) [54]. These protocols are mainly designed for stationary networks. They usually employ query flooding as a powerful method to discover data delivery paths. In mobile UWSNs, however, most sensor nodes are mobile, and the 'network topology' changes very rapidly. The frequent maintenance and recovery of forwarding paths is very expensive in highly dynamic networks, and even more expensive in dense three-dimensional UWSNs.

Reliable data transfer

Reliable data transfer is important in UWSNs, especially for those aquatic exploration applications requiring reliable information. There are typically two approaches to reliable data transfer: end-to-end and hop-by-hop. The most common end-to-end solution Transmission Control Protocol (TCP). In UWSNs, due to the high and dynamic channel error rates and the long propagation delay, TCP's performance will be problematic.

EXCELLENT PUBLISHERS

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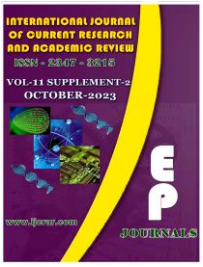

Localization

Localization of mobile sensor nodes is indispensable for UWSNs. Some applications such as aquatic monitoring demands high-precision localization, while other applications such as surveillance network require a localization solution that can scale to a large number of nodes.

However, underwater acoustic propagation characteristics and sensor mobility pose great challenges on high-precision and scalable localization solutions in that: (i) underwater acoustic channels are highly dispersive, and time delay of arrival (TDOA) estimation is hampered by dense multipath; (ii) acoustic signal does not travel on a straight path due to the stratification effect; (iii) underwater acoustic channels have extremely low bandwidth that renders any approach based on frequent message exchange not appealing; (iv) large scale sensor deployment prevents centralized solutions; and (v) sensor mobility entails dynamic network topology change.

Conclusion

Up to date and extending to the near future, acoustic waves will be staying as the major carrier of wireless communication in UWSNs. For acoustic wave carriers, apparently the key challenges are in communication and networking

For EM radio wave carriers, the main shortcoming stays with the high absorption of EM waves in water, especially in seawater. Though short-range wireless communication using EM waves in seawater has seen certain breakthroughs, it will still be a long way to expand the approach to be used in UWSNs

Optical carriers will remain as to be used for some special applications. The major hurdle is that OCOMM in water is largely constrained by environments

In short, this review article has analyzed the necessity of considering the physical fundamentals of an underwater environment for a particular kind of physical wave to be used as the carrier of wireless communication among nodes in an UWSN. Acoustic wave remains the most robust and feasible carrier up to the date.

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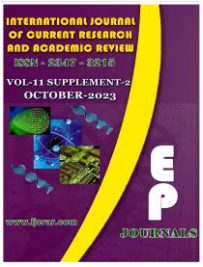

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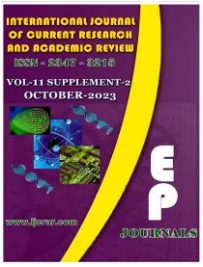

Full Length Article **IJCRAR/FL/104**

Long-Term Trends in the Public Perception of Artificial Intelligence

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Abstract

Analyses of text corpora over time can reveal trends in beliefs, interest, and sentiment about a topic. We focus on views expressed about artificial intelligence (AI) in the New York Times over a 30-year period. General interest, awareness, and discussion about AI has waxed and waned since the field was founded in 1956. We present a set of measures that captures levels of engagement, measures of pessimism and optimism, the prevalence of specific hopes and concerns, and topics that are linked to discussions about AI over decades. We find that discussion of AI has increased sharply since 2009, and that these discussions have been consistently more optimistic than pessimistic. However, when we examine specific concerns, we find that worries of loss of control of AI, ethical concerns for AI, and the negative impact of AI on work have grown in recent years. We also find that hopes for AI in healthcare and education have increased over time.

Keywords: Artificial intelligence, Entertainment media, Public understanding.

Introduction

Artificial intelligence will spur innovation and create opportunities, both for individuals and entrepreneurial companies, just as the Internet has led to new businesses like Google and new

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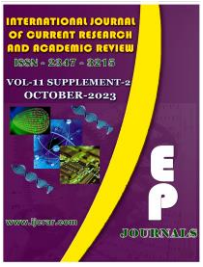

forms of communication like blogs and social networking. Smart machines, experts predict, will someday tutor students, assist surgeons and safely drive cars.

In the wake of recent technological advances in computer vision speech recognition and robotics, scientists say they are increasingly concerned that artificial intelligence technologies may permanently displace human workers, roboticist warfare and make Orwellian surveillance techniques easier to develop, among other disastrous effects.

Understanding public concerns about AI is important, as these concerns can translate into regulatory activity with potentially serious repercussions (Stone, P. *et al.,* 2016). For example, some have recently suggested that the government should regulate AI development to prevent existential threats to humanity (Guardian 2014). Others have argued that racial profiling is implicit in some machine learning algorithms, in violation of current law (Pro Publican 2016). More broadly, if public expectations diverge too far from what is possible, we may court the smashed hopes that often follow from intense enthusiasm and high expectations.

AI presents a difficult case for studies of topic sentiment over time because the term is not precisely defined. Lay peo ple and experts alike have varied understandings of what "artificial intelligence" means (Stone, P. *et al.,* 2016). Even in the narrowest, engineering-centric definitions, AI refers to a broad constellation of computing technologies.

We present a characterization of impressions expressed about AI in the news over 30 years. First, we define a set of indicators that capture levels of engagement, general sentiment, and hopes and concerns about AI. We then apply and study these indicators across 30 years of articles from the New York Times. As a proxy for public opinion and engagement, no other corpus extends so far into the past to capture how a general audience thinks about AI. Moving forward, we can apply these indicators to present day articles in an ongoing effort to track public perception.

Our study relies on a combination of crowdsourcing and natural language processing. For each article under analysis, we extract all mentions of artificial intelligence and use paid crowdsourcing to annotate these mentions with measures of relevance, their levels of pessimism or optimism about AI, and the presence of specific hopes and concerns, such as "losing control of

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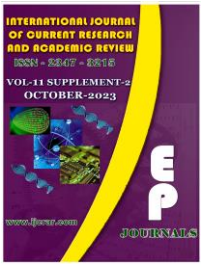

AI" or "AI will improve healthcare." These annotations form the basis of the indicators and allow us to bootstrap a classifier that can automatically extract impression about AI, with applications to tracking trends in new articles as they are generated.

Indicators of Impressions about AI

We capture the intensity of engagement on AI in the news as well as the prevalence of a diverse set of hopes and concerns about the future of AI. We took inspiration from the Asilomar Study of 2008-09 (Horvitz and Selman 2009) and the One Hundred Year Study on Artificial Intelligence (Stanford University 2014) to create measures that capture a long-term perspective for how AI impacts society.

General

We have included the following general measures:

Engagement

This measure serves as a proxy for public interest and engagement around AI, capturing how much AI is discussed in the news over time.

Optimism vs. Pessimism

This measure captures the attitude of a discussion—the degree to which it implies a sense of optimism or pessimism about the future of AI. This attitude can stem from technological progress, such as optimistic reporting on new breakthroughs in deep learning. But it can also be influenced by the impact of new technologies on society: for example, the time-saving benefits of a self- driving car (a form of optimism); or the dangers of surveil- lance as data is collected and mined to track our leanings, lo- cations, and daily habits (a form of pessimism). We include such *attitudinal* leanings as an indicator to track these high- level trends. Notably, traditional sentiment analysis does not capture optimism versus pessimism.

The remainder of our indicators capture common hopes and concerns about the future of AI.

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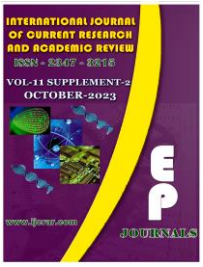

Hopes of Artificial Intellegence

We have included the following hopes for AI as indicators:

Impact on work (positive)

AI makes human work easier or frees us from needing to work at all, e.g., by managing our schedules, automating chores via robots.

Education

AI improves how students learn, e.g., through automatic tutoring or grading, or providing other kinds of personalized analytics.

Transportation

AI enables new forms of transportation, e.g., self-driving cars, or advanced space travel.

Healthcare

AI enhances the health and well-being of people, e.g., by assisting with diagnosis, drug discovery, or enabling personalized medicine.

Decision making

AI or expert systems help us make bet- ter decisions, e.g., when to take a meeting, or case-based reasoning for business executives.

Entertainment

AI brings us joy through entertainment, e.g., though smarter enemies in video games.

Singularity (positive)

A potential singularity will bring positive benefits to humanity, e.g., immortality.

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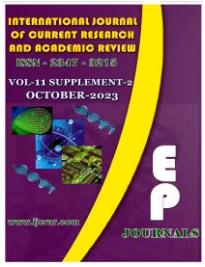

Merging of human and AI (positive)

Humans merge with AI in a positive way, e.g., robotic limbs for the disabled, positive discussions about potential rise of transhumanism.

Concerns for Artificial Intelligence

We have also considered the following concerns for AI:

Loss of control

Humans lose control of powerful AI systems, e.g., Skynet or "Ex Machine" scenarios.

Impact on work (negative)

AI displaces human jobs, e.g., large-scale loss of jobs by blue collar workers.

Military applications

AI kills people or leads to instabilities and warfare through military applications, e.g., robotic soldiers, killer drones.

Absence of Appropriate Ethics

AI lacks ethical reasoning, leading to negative outcomes, e.g., loss of human life.

Lack of progress

The field of AI is advancing more slowly than expected, e.g., unmet expectations like those that led to an AI Winter.

Singularity (negative)

The singularity harms humanity, e.g., humans are replaced or killed.

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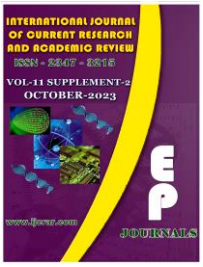

Merging of human and AI (negative)

Humans merge with AI in a negative way, e.g., cyborg soldiers.

Crowdsourcing to Annotate Indicators

Crowdsourcing provides an efficient way to gather annotations for our dataset of AI-related paragraphs. In this section, we present the details of the approach.

Interpreting annotations for hopes and concerns

One decision we must make is how to interpret the crowd annotations for hopes and concerns. Should we require that all three workers mark a paragraph with a hope or concern to include it in our data? Or trust the majority vote of two workers? Or require only one worker's vote?

External validity

Concretely, we train a classifier to predict the presence of *loss of control* in paragraphs about AI using our annotated data from the New York Times. We then apply this classifier to posts made by Reddit users. We use a logistic regression model based on TF-IDF features and threshold the positive class probability at 0.9. In validation, we observe precision of 0.8 on a sample of 100 Reddit posts annotated with ground truth. Finally, we apply this classifier to every post that mentioned "artificial intelligence" from 2010 to 2015.We present the resulting trend in Figure 4, which mirrors Figure 3M over the same time period. Broadly, this replica tion suggests that attitudes among Reddit users shift in line with what we see in the New York Times, providing some evidence for the external validity of our findings.

Related Work

Others have discussed the impact of artificial intelligence on society and the range of future outcomes (Dietterich and Horvitz 2015). These discussions are in part driven by a need to address public concerns about AI—our work is the first to quantify such concerns through direct analysis.

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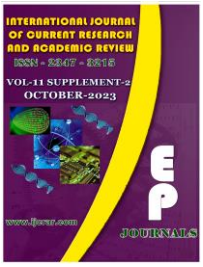

The set of in- dictators we have introduced will be useful in framing future discussions, such as those ongoing in the One Hundred Year Study of Artificial Intelligence (Stanford University 2014).

Public opinion polls have similarly measured topics relevant to AI. While such polls are recent (and not conducted over time), they support our findings, showing greater levels of optimism than pessimism about AI, but increasing existential fear and worry about jobs (BSA 2015; 60 Minutes 2016). Future polls might allow us to directly measure public opinion on the set of measures we have studied.

Beyond artificial intelligence, other work has mined cultural perspectives from text corpora over long time periods. For example, by analyzing 200 years of data from Google Books, it is possible to quantify the adoption of new technologies or changes in psychological attitudes through linguistic patterns (Michel *et al.,* 2011; Greenfield 2013). Using music, others have quantified changes in artistic style over a 40-year period (Serra` *et al.,* 2012). We use crowdsourced annotations to extend the limits of what is possible under these kinds of quantitative analyses.

Conclusion

We present a set of indicators that capture levels of engagement, general sentiment, and hopes and concerns for the future of artificial intelligence over time. We then validate these impression indicators by studying trends in 30 years of articles from the New York Times. We find that discussion of AI has increased sharply since 2009 and has been consistently more optimistic than pessimistic. However, many specific concerns, such as the fear of loss of control of AI, have been increasing in recent years.

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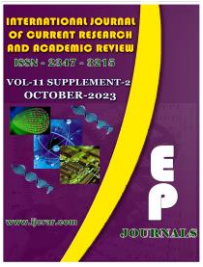

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