DEMYSTIFYING EMERGING TRENDS IN GREEN TECHNOLOGY

Editors:
Pankaj Kumar Mishra
Satya Prakash Yadav

Bentham Books

Emerging Trends in Computation Intelligence and Disruptive Technologies

(Volume 3)

Demystifying Emerging Trends in Green Technology

Edited By

Pankaj Kumar Mishra
Hi-Tech Institute of Engineering and Technology
Ghaziabad, UP
India

&

Satya Prakash Yadav
School of Computer Science Engineering and Technology
(SCSET)
Bennett University, Greater Noida
U.P., India

Emerging Trends in Computation Intelligence and Disruptive Technologies

(Volume 3)

Demystifying Emerging Trends in Green Technology

Editor: Pankaj Kumar Mishra and Satya Prakash Yadav

First published in 2025.

need for a court order if at any point you breach any terms of this License Agreement. In no event will any delay or failure by Bentham Science Publishers in enforcing your compliance with this License Agreement constitute a waiver of any of its rights.

3. You acknowledge that you have read this License Agreement, and agree to be bound by its terms and conditions. To the extent that any other terms and conditions presented on any website of Bentham Science Publishers conflict with, or are inconsistent with, the terms and conditions set out in this License Agreement, you acknowledge that the terms and conditions set out in this License Agreement shall prevail.

Bentham Science Publishers Pte. Ltd.
80 Robinson Road #02-00
Singapore 068898
Singapore
Email: subscriptions@benthamscience.net

CONTENTS

PREFACE

This book titled, Emerging Trends in Computational Intelligence and Disruptive Technologies, is revolutionizing the way we approach the ecological footprint of computer networks. Communication systems, and other IT infrastructures are growing due to high energy consumption and greenhouse gas emissions. Addressing these issues and creating a sustainable environment require new energy models, algorithms, methods, platforms, tools, and systems to support next-generation computing and communication infrastructure.

The chapters within this volume serve as portals to diverse domains where these trends intersect, offering insights, analyses, and projections to innovative ideas. Through these contributions, readers will embark on a journey through cutting-edge developments, envisioning a future where computational intelligence and disruptive technologies intertwine to revolutionize the way we live, work, and interact.

In this book, we explore the role of Disruptive Technologies and Computational Intelligence which aims to bring together leading academic scientists, researchers, and research scientists to exchange and share their experiences and research results in various aspects of green technology and energy science. It also provides a major interdisciplinary platform for researchers, practitioners, and educators to present and discuss the latest innovations, trends, and issues in computational intelligence and disruptive technologies, as well as practical challenges and adopted solutions.

This book is a comprehensive guide for anyone interested in learning about the role of emerging trends in computational intelligence and disruptive technologies in various sectors.

<div align="right">

Pankaj Kumar Mishra
Hi-Tech Institute of Engineering and Technology
Ghaziabad, UP
India

&

Satya Prakash Yadav
School of Computer Science Engineering and Technology (SCSET)
Bennett University, Greater Noida
U.P., India

</div>

List of Contributors

A.K. Jain	Department Electrical Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India
Anubhav Sharma	Computer Science and Engineering, IMS Engineering College, Ghaziabad, India
Ankit Garg	Management Department, Ajay Kumar Garg Institute of Management, Ghaziabad, Uttar Pradesh, India
Ashish Pandey	School of Computer Science & Application, IIMT University, Meerut, Uttar Pradesh, India
Ashish Diwakar	Depatment of Management Studies, Hi-Tech Institute of Engineering and Technology, Ghaziabad, (U.P.), India
Arunima Jaiswal	Department of Computer Science & Engineering, Indira Gandhi Delhi Technical University For Women, India
Aruna Ippili	Department of Computer Science & Engineering, Indira Gandhi Delhi Technical University For Women, India
Ashutosh Saxena	Department of Computer Science and Engineering, ABES Engineering College, Ghaziabad, India
Aditya Garg	Department of Computer Science and Engineering, ABES Engineering College, Ghaziabad, India
Arun Kumar Singh	Greater Noida Institute of Technology Gr Noida-201306, Uttar Pradesh, India
Akhilesh Kumar Singh	School of Computing and Technology, Galgotias University, Greater Noida 201306, Uttar Pradesh, India
Abhishek Anand	Department of Computer Science Engineering Sharda University, Greater Noida, Uttar Pradesh 201310, India
Abhinav Shrivastav	Department of Computer Science Engineering Sharda University, Greater Noida, Uttar Pradesh 201310, India
Arun Kumar Singh	Department of Computer Science and Engineering, Greater Noida Institute of Technology, Greater Noida, 201310, Uttar Pradesh, India
Adarsh Kumar	Hi-Tech Institute of Engineering and Technology, Ghaziabad, Uttar Pradesh, India
Anupam Singh	Department of ECE, HI-Tech Institute of Engineering and Technology, Gzb, UPTU, India
Anuja Gupta	Department of ECE, HI-Tech Institute of Engineering and Technology, Gzb, UPTU, India
Avinash Kumar Sharma	Department of CSE, ABES Institute of Technology, Ghaziabad, Uttar Pradesh, India
Asjad Moiz Khan	Computer Science & Technology, Sharda University, Greater Noida, (U.P.), India
Ayu Kumar Jain	Department of Applied Science & Humanities, Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P) India

Aman Shrivastava	Department Electrical Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India
B. Shajahan	School of Computer Science and Engineering, GB Nagar, Uttar Pradesh, India
Bobbin Preet	ECE Department, Chandigarh University, Uttar Pradesh, India
Bhaskar Sharma	Department Electrical Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India
Deepanshu Singh	Kiet Group of Institutions, Delhi-Ncr, Ghaziabad, Uttar Pradesh 201206, India
Dhruv Verma	Computer Science and Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, U.P, India
Divya G.	Electrical and Electronics Engineering, CVR College of Engineering, Telangana, Hyderabad, India
Gautam Jaiswal	School of Business Management, NOIDA International University, Gr Noida, Uttar Pradesh, India
Gunjan Aggrawal	Department of Computer Science Engineering Sharda University, Greater Noida, Uttar Pradesh 201310, India
Harsh Dev	Department of Computer Science & Engineering, Pranveer Singh Institute of Technology, Kanpur, Uttar Pradesh, India
Himanshu Monga	ECE Department JLN Government Engineering College Sundar Nagar, Mandi, India
Hoshiyar Singh Kanyal	Depatment of Computer Science & Engg., Hi-Tech Institute of Engineering and Technology, Ghaziabad, (U.P), India
Himanshu Kumar	Depatment of Management Studies, Hi-Tech Institute of Engineering and Technology, Ghaziabad, (U.P.), India
Harsh Panwar	Computer Science and Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, U.P, India
Himanshi Mittal	Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India
Hoor Fatima	Computer Science & Technology, Sharda University, Greater Noida, (U.P.), India
Istakbal Khan	Department of Applied Science & Humanities, Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India
Jully	Department of Management, Hi-tech Institute of Engineering & Technology, Ghaziabad, India
Jyoti Rai	Depatment of Applied Science and Humanities R.D. Engineering College, Ghaziabad, (U.P.), India
Khushboo Kem	Department of Computer Science & Engineering, Indira Gandhi Delhi Technical University For Women, India
Laxmi Ahuja	AIIT Amity University Noida, Noida, Uttar Pradesh 201313, India
Lydia Nenghoithem Haokip	Department of Computer Science & Engineering, Indira Gandhi Delhi Technical University For Women, India

Manish Aggarwal	Department of Applied Science & Humanities, Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India
Manish Kumar	Department of Civil Engineering, Greater Noida Institute of Technology, Greater Noida, U.P., India
Meenu Khurana	Chitkara University Institute of Engineering and Technology Chitkara University, Himachal Pradesh, India
Manu Singh	Department of Computer Science and Engineering, ABES Engineering College, Ghaziabad, India
Mahesh Kumar Singh	Dronacharya Group of Institutions, Greater Noida-201306, Uttar Pradesh, India
Mansi Singhal	Department of Management Studies, Hi-Tech Institute of Engineering and Technology, Ghaziabad, (U.P.), India
Mohd. Naushad Ali	Department of Management, Hi-tech Institute of Engineering & Technology, Ghaziabad, India
Manasvi Agarwal	Computer Science and Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, U.P, India
Mansi Jain	Computer Science and Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, U.P, India
Namrata Dhanda	Department of Computer Science & Engineering, Amity University, Uttar Pradesh, India
Neha Kapur	CSE, Chandigarh University, Uttar Pradesh, India
Nitin Sachdeva	IT Department,, Galgotias College of Engineering, Greater Noida, India
Nitin Vera	Computer Science and Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, U.P, India
Omkar Singh Kardam	Hi-Tech Institute of Engineering and Technology, Ghaziabad, Uttar Pradesh, India
Priyanka	Department of Management Studies, Hi-Tech Institute of Engineering and Technology, Ghaziabad, (U.P.), India
Parul Verma	Depatment of Applied Science and Humanities, Ajay Kumar Garg. Engineering College, Ghaziabad, (U.P.), India
Praveen Chandra Jha	Depatment of Applied Science and Humanities, ITS Engineering College, Greater Noida (U.P.), India
Priyansha Singh	Department of CSE, ABES Institute of Technology, Ghaziabad, Uttar Pradesh, India
Pragya Agarwal	Hi-Tech Institute of Engineering and Technology, Ghaziabad, India
Pushpa Choudhary	Galgotias College of Engineering and Technology, Greater Noida-201306, Uttar Pradesh, India
Pushpendra Singh	SRMIST Delhi NCR Campus Modi Nagar Ghaziabad UP 201204, Uttar Pradesh, India
Piyush Sharma	Computer Science & Technology, Sharda University, Greater Noida, (U.P.), India

Pankaj Kumar Mishra	Department of Mechanical Engineering, HI-Tech Institute of Engineering and Technology, Ghaziabad-201009, India
Praveen Chandra Jha	Department of Applied Science, I.T.S., Greater Noida-201306, India
Pragya Agarwal	Hi-Tech Institute of Engineering & Technology, Ghaziabad, Uttar Pradesh, India
Preeti Dubey	Computer Science & Technology, Sharda University, Greater Noida, (U.P.), India
Pratyush Prashar	Information Technology Sharda University, Plot No. 32-34, Knowledge Park III, Greater Noida, Uttar Pradesh 20131, India
Priyanka Tyagi	Information Technology Sharda University, Plot No. 32-34, Knowledge Park III, Greater Noida, Uttar Pradesh 20131, India
Ramashankar	Department of Civil Engineering, Greater Noida Institute of Technology, GNIOT, Greater Noida, Uttar Pradesh, India
Ranvee Kashyap	School of Computer Science and Engineering, GB Nagar, Uttar Pradesh, India
Rohit Kumar	School of Computer Science and Engineering, GB Nagar, Uttar Pradesh, India
Ramander Singh	Computer Science and Engineering, Amity University, Haryana, Uttar Pradesh, India Depatment of Computer Science and Engineering, IMS Engineering College, Ghaziabad, (U.P.), India
Ritesh Kumar Singhal	Ajay Kumar Garg Institute of Management, Ghaziabad, Uttar Pradesh 201206, India
Riti Rathore	Department of Computer Science and Engineering, Ajay Kumar Garg Engineering College, Ghaziabad-201009, India
Rama Krishna Challa	Chitkara University Institute of Engineering and Technology, Chitkara University Punjab, India
Rashmi Sharma	Department of Information Technology, Ajay Kumar Gag Engineering College, Ghaziabad, UP, India
Ritik Manga	Computer Science and Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, U.P, India
Rishabh Kumar	Computer Science and Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, U.P, India
Ritesh Gautama	Computer Science and Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, U.P, India
Ravi Raman	Department of Civil Engineering, Greater Noida Institute of Technology, GNIOT, Greater Noida, Uttar Pradesh, India
Raj Gopal Mishra	Hi-Tech Institute of Engineering and Technology, Ghaziabad, Uttar Pradesh, India
Ram Kishor Gupta	Department of Mechanical Engineering, HI-Tech Institute of Engineering and Technology, Ghaziabad-201009, India
Sachin	Computer Science ABES Engineering College, Ghaziabad, India

Satpal Singh	Department of Computer Science, Punjabi University, Patiala, India
Subhash Chander	Department of Computer Science, University College Jaito, Jaito, India
Sharda Tiwari	Department of Computer Science & Engineering, Amity University, Uttar Pradesh, India
Satyam Kumar Nikhil	School of Computer Science and Engineering, GB Nagar, Uttar Pradesh, India
Shreyansh Gupta	Computer Science ABES Engineering College, Ghaziabad, India
Sonia Verma	Computer Science ABES Engineering College, Ghaziabad, India
Sachin Kumar	Department of Civil Engineering, Greater Noida Institute of Technology, Greater Noida, U.P., India
Shreeja Kacker	Department of Civil Engineering, Greater Noida Institute of Technology, Greater Noida, U.P., India
Shruti Gupta	ABES Engineering College, Ghaziabad, India
Satish Kumar	Management Department, Ajay Kumar Garg Institute of Management, Ghaziabad, India
Shikha Jain	Kiet Group of Institutions, Delhi-Ncr, Ghaziabad, Uttar Pradesh 201206, India
Swasti Singhal	AIIT Amity University Noida, Noida, Uttar Pradesh 201313, India
Shiva Tyagi	Department of Computer Science and Engineering, Ajay Kumar Garg Engineering College, Ghaziabad-201009, India
Samyak Jain	Department of Computer Science and Engineering, ABES Engineering College, Ghaziabad, India
Shalin Kumar	Department of Applied Science, Greater Noida Institute of Technology, Greater Noida, (U.P), India Hi Tech Institute of Engineering and Technology, Ghaziabad, Uttar Pradesh, India
Surbhi Agarwal	Depatment of Management Studies, Hi-Tech Institute of Engineering and Technology, Ghaziabad, (U.P.), India
Siddhartha Srivastava	Department of Information Technology, Ajay Kumar Gag Engineering College, Ghaziabad, UP, India
Santosh Kumar	Department of Management, Hi-tech Institute of Engineering & Technology, Ghaziabad, India
Shubhangi Singh	Computer Science & Technology, Sharda University, Greater Noida, (U.P.), India
Shivam Raj	Department of Civil Engineering, Greater Noida Institute of Technology, GNIOT, Greater Noida, Uttar Pradesh, India
Sachin Gautam	Department of Civil Engineering, Greater Noida Institute of Technology, GNIOT, Greater Noida, Uttar Pradesh, India
Sumit Kumar	Hi-Tech Institute of Engineering and Technology, Ghaziabad, Uttar Pradesh, India

Somya Goel	Department of ECE, HI-Tech Institute of Engineering and Technology, Ghaziabad, UPTU, India
Shilpa Chaudhary	Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India
Sheelesh Kumar Sharma	Department of CSE, ABES Institute of Technology, Ghaziabad, Uttar Pradesh, India
Srishti Garg	Department of CSE, ABES Institute of Technology, Ghaziabad, Uttar Pradesh, India
Sujoy Mondol	Computer Science & Technology, Sharda University, Greater Noida, (U.P.), India
Syed Mohammad Moiez Ur Rahman	Computer Science & Technology, Sharda University, Greater Noida, (U.P.), India
Shubham Kumar Mishra	Information Technology Sharda University, Plot No. 32-34, Knowledge Park III, Greater Noida, Uttar Pradesh 20131, India
Surendra Singh	Department of Applied Science & Humanities, Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India
Somaya Goel	Department Electrical Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India
Tushar	ABES Engineering College, Ghaziabad, India
Tanvi Agarwal	Department of Management, Hi-tech Institute of Engineering & Technology, Ghaziabad, India
Tanu Gupta	Department of ECE, HI-Tech Institute of Engineering and Technology, Gzb, UPTU, India
Uday Tyagi	Computer Science ABES Engineering College, Ghaziabad, India
V.V. Kolomiets	Agriculture University, Kharkov, Ukraine
Varun Upadhayay	ABES Engineering College, Ghaziabad, India
Vartika Srivastava	ABES Engineering College, Ghaziabad, India
Vandana Saini	Chitkara University Institute of Engineering and Technology Chitkara University, Himachal Pradesh, India
Vipul Kumar	Department of Management Studies, Hi-Tech Institute of Engineering and Technology, Ghaziabad, (U.P.), India
Vinay Kumar Agarwal	Department of Management, Hi-tech Institute of Engineering & Technology, Ghaziabad, India
Vipin Kumar Pal	Computer Science and Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, U.P, India
Vipin Kumar Tomer	Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India
Vijay Kumar	Department of Mechanical Engineering, I.M.T., Greater Noida-201306, India
Vipin Tomer	Hi-Tech Institute of Engineering & Technology, Ghaziabad, Uttar Pradesh, India
Venkata Padmavathi S.	Gitam School of Technology, Gitam Deemed to be University Telangana, Hyderabad, India

Yashaswi	Department of CSE, ABES Institute of Technology, Ghaziabad, Uttar Pradesh, India
Yashraj Mishra	Kiet Group of Institutions, Delhi-Ncr, Ghaziabad, Uttar Pradesh 201206, India
Yash Modi	Kiet Group of Institutions, Delhi-Ncr, Ghaziabad, Uttar Pradesh 201206, India

CHAPTER 1

Trust-Based Neighbor Selection Protocol to Elect Leader in Blockchain using zk-SNARKs Algorithms

Satpal Singh[1,*] and **Subhash Chander[2]**

[1] *Department of Computer Science, Punjabi University, Patiala, India*

[2] *Department of Computer Science, University College Jaito, Jaito, India*

Abstract: Blockchain stores and writes all the transactions because of the unlimited storage capacity. Leader election is the process of electing a node as an overall in-charge of the distributed network. Leader election is a complicated task as we have to choose a leader by giving equal opportunity to all the nodes. We implement all the algorithms of the DONS protocol in order to elect a leader but in our TBNS (Trust Based Neighbor Selection) protocol, we add zk-SNARKs proof to enhance the security of Blockchain. zk-SNARKs (Zero-Knowledge Succinct Non-Interactive Argument of Knowledge) is a type of proof used in cryptography to prove the authenticity of information without revealing any additional information. It allows one party to prove to another that they know a certain piece of information without actually revealing the information itself. In the end, the results of our proposed model are compared with RTT-NS and DONS.

Keywords: Blockchain, TBNS, zk-SNARK.

INTRODUCTION

Blockchain is a distributed ledger that can continuously grow and store a large amount of data. Mining is the process to append a new block onto the chain and this task is completed by the miners. Many nodes in the network compete with each other in order to mine a block and get the reward [1]. We already go through a lot many consensus algorithms *i.e.* PoW, PoS, PoC, *etc.* that help us deduce a miner. However, these algorithms are complex, time-consuming, and waste resources because a lot of resources, energy, time, and efforts are required by the users to find out the validator or miner [2-4].

[*] **Corresponding author Satpal Singh:** Department of Computer Science, Punjabi University, Patiala, India;
E-mail: spsingh.mohali@gmail.com

In our proposed TBNS model, blockchain stores and writes all transactions because of the unlimited storage capacity. Instead of deducing a miner by implementing complex algorithms like PoW, PoS, PoET, *etc.*, we go for a leader election process. Leader election is the process of electing a node as an overall in-charge of the distributed network [5-8]. Leader election is a complicated task as we have to choose a leader by giving an equal opportunity to all the nodes. We have implemented all eight algorithms of the DONS protocol but with enhanced protection of zk-SNARKs algorithm. It allows one party to prove to another that they know a certain piece of information without actually revealing the information itself [9, 10]. This type of proof is often used in blockchain systems to improve privacy and security. By using zk-SNARKs, a blockchain system can ensure the authenticity of transactions without revealing the details of those transactions to unauthorized parties [11-13].

The contributions of this study are as follows:

1. **Proposal of TBNS Protocol**: The study introduces the Trust-Based Neighbor Selection (TBNS) protocol for leader election in blockchain networks. Unlike traditional consensus mechanisms such as PoW, PoS, and PoET, TBNS focuses on a leader election process that provides an equal opportunity to all nodes, aiming for a more efficient and resource-saving approach.
2. **Integration of zk-SNARKs for Enhanced Security**: The TBNS protocol incorporates zk-SNARKs (Zero-Knowledge Succinct Non-Interactive Argument of Knowledge) to enhance the security of the blockchain network. This cryptographic proof allows for the verification of information authenticity without revealing any additional information, thereby improving privacy and security.
3. **Comparison with Existing Protocols**: The study compares the performance of the TBNS protocol with existing protocols like DONS (Dynamic Optimized Neighbor Selection) and RTT-NS (Round Trip Time Neighbor Selection). The results show that TBNS outperforms these protocols in terms of finalization time, demonstrating its effectiveness and efficiency.
4. **Implementation and Validation**: The algorithms and procedures for leader election using TBNS and zk-SNARKs are implemented in Python, providing a practical validation of the proposed model. This implementation ensures that the theoretical aspects of the protocol are backed by empirical results.
5. **Detailed Protocol Steps and Algorithms**: The study provides a comprehensive set of algorithms (Algorithm 1 to Algorithm 8) that detail the steps involved in the TBNS protocol, including message handling, local record checking, request for confirmation, local network view computation, voting, leader recognition, network topology establishment, and optimized neighbor

selection. This detailed approach ensures that the protocol is transparent and reproducible.

PROPOSED MODEL

Baniata *et al.* proposed DONS (Dynamic Optimized Neighbor Selection) for smart Blockchain, which initially requires the full view of the blockchain network to compute MST. Also, as per network dynamicity, nodes joining and leaving the network must be updated in this view. The network view will be shared with the leader based on which MST derived by the leader in polynomial time will be broadcasted in the network. The network nodes are only able to read their own and neighbor ID's. Therefore, no network node can deduce the miner's private data, also no node has information about the elected leader unless the node itself is a leader.

Problem in Leader election: The Leader node is also a blockchain node with similar characteristics as of other nodes like failure, unavailability, and attacks. So, the Leader election will be performed in the way explained below:

Step I: Network initialization

Initially all the nodes in the network know the identity of their neighbors and expected round trip time (ERT), when communicating with nodes. Also in the beginning, all the node parameters are set to default parameters of the network or protocol as node_status = normal_node.

confirmation_required = equal or higher than the average nodes (50%)

current_Leader = [Null], MST= [], Round_time =T.

Step II: Network view

Once a node or miner fails to join the network *i.e.* network view is fixed then the process for Leader election is initialized. When the process ID is initialized, the default node status as in Step I, is updated to probable leader.

node_status= probable_Leader

Broadcast message to elect the Leader that contains:

Timestamp (t) \\ imported from step I

Votes= Dict{}, nodes_list(NL) = List[]

Message initialized and broadcasted.

CHAPTER 2

Electronic Healthcare Data Security Using Blockchain

Sharda Tiwari[1,*], Namrata Dhanda[1] and Harsh Dev[2]

[1] Department of Computer Science & Engineering, Amity University, Uttar Pradesh, India

[2] Department of Computer Science & Engineering, Pranveer Singh Institute of Technology, Kanpur, Uttar Pradesh, India

Abstract: In this paper, a blockchain-based healthcare security system as a solution for preventing data forging is proposed. The proposed model for healthcare data security is based on blockchain and its smart contract execution in a secure way. We proposed a system where users can access the open surveys and participate in these surveys. Moreover, their answers cannot be changed by anonymous or 3rd party people with smart contract control. At the same time, to ensure the confidentiality of the patient's data, we kept the hashed value of the information we collected from the patient's survey data as evidence and the encrypted version so that data can be used for the evaluation, in the relevant storage units of the generated decentralized application.

Keywords: Component, Formatting, Insert (key words), Style, Styling.

INTRODUCTION

Technology is quickly advancing every day. Many tasks were previously completed physically in real life and then shifted to the digital workflow because of this advancement [1-5]. For instance, technology has an impact on finance, trade, multimedia, and advertising. At the same time, another area affected by these technological developments is the health field. Especially with the spread of the internet, the strengthening of computer technologies, and the learning of technology by people working in the field, most health-related data transactions began to be stored in digital areas. During these transitions, databases were used as the first solution for storing health data. As a result of this transition, the amount of data stored electronically has increased day by day. Due to both speed and memory requirements, distributed database structures were established. These

* **Corresponding author Sharda Tiwari:** Department of Computer Science & Engineering, Amity University, Uttar Pradesh, India; E-mail: shardatiwari87@gmail.com

accomplishments and transitions have been very beneficial for healthcare and many other sectors [6-10]. However, it is an undeniable fact that there are parts of technology that cause difficulties in the field of health, as in every field. The most concerning subject among these challenges is the security of healthcare data. The medical operations and their results may contain sensitive or private data that is not desired to be captured or exposed by others. Therefore, ensuring the security of healthcare data is significantly necessary. Due to the necessity of providing security, many studies have been achieved about e-healthcare data protection, since the beginning of healthcare data processing in digital areas. The solution to the security concerns relies on the fundamentals of cryptography as confidentiality, integrity, and authentication. Many techniques have already been developed to provide these cryptographic fundamentals. These security problems can be eliminated with the combination of cryptographic techniques such as authorization control, encryption, masking, anonymization, *etc.* [11-15].

Research Motivation

The motivation behind the research is the need to revolutionize healthcare systems and improve patient outcomes.

- One of the main motivations is the potential to detect diseases at an early stage. Early disease detection can lower healthcare expenditures and significantly improve treatment outcomes [16-20].
- Another motivation is the ability to remotely monitor and manage patients' health conditions. Remote monitoring allows healthcare providers to track patients' health status in real time, enabling early intervention and personalized care plans. Additionally, IoT Based Disease Prediction systems can contribute to the development of personalized medicine [21-23].
- A further driving force behind research has been the need to solve issues with existing healthcare systems, like excessive wait times, restricted access to care, and underutilization of available resources. IoT Based Disease Prediction systems have the potential to overcome these challenges by providing timely and accurate health monitoring, early detection of diseases, and efficient resource allocation.

Furthermore, research improved population health management. By utilizing IoT devices and predictive models, healthcare providers can gain insights into population health trends, identify high-risk individuals or communities, and implement preventive measures to reduce the prevalence of diseases.

Research Gaps

While there have been significant advancements in the field of IoT-based Disease Prediction and management using Blockchain technology, there are still some research gaps that need to be addressed.

- **Integration of IoT devices and sensors:** Although IoT devices play a crucial role in collecting real-time health data; there is a need for further research on the integration of a wider range of IoT devices and sensors. This integration will allow for more comprehensive and accurate data collection, leading to better disease prediction and management.
- **Standardization and interoperability:** One of the challenges in implementing IoT Based Disease Prediction systems is the absence of common frameworks and protocols for data interchange and interoperability among various IoT platforms and devices. This research gap highlights the need for developing standardized protocols and frameworks that enable seamless interoperability between IoT devices, ensuring effective data sharing and analysis for disease prediction
- **Data security and privacy:** Another research gap in the field of IoT Based Disease Prediction and management using Blockchain is the need for robust data security and privacy mechanisms. The security and privacy of patient data are becoming more and more important as healthcare data becomes more digital. Blockchain technology can help by enabling the decentralized and unchangeable storage of medical records.
- **Integration with Electronic Health Records:** EHR systems play a significant role in healthcare data management. However, there is a research gap in understanding how IoT Based Disease Prediction systems can effectively integrate with existing EHR systems. This integration would allow for seamless data sharing and analysis between IoT devices and EHR systems, leading to more accurate disease prediction and management.
- **Scalability and performance:** The scalability and performance of IoT Based Disease Prediction systems using Blockchain technology are important considerations. Research is needed to explore ways to optimize the performance of Blockchain-based IoT systems, addressing issues such as transaction processing speed and scalability to handle large amounts of data.

CONTRIBUTION

Data preservation and data immutability are the main requirements for electronic health record systems. In this paper, a system has been designed that aims to save the e-health record data and their results as evidence. Since proof immutability is the main requirement of these kinds of systems, an immutable ledger mechanism

CHAPTER 3

E-cops - An Online Crime Reporting System

Ranvee Kashyap[1], Rohit Kumar[1], Satyam Kumar Nikhil[1] and **B. Shajahan[1,*]**

[1] *School of Computer Science and Engineering, GB Nagar, Uttar Pradesh, India*

Abstract: Transmit information on cutting-edge police and policing tools, create the framework for firms to use in order to obtain incident reports, cut down on employee resources, and enable these enforcement offices to reallocate resources to nearby areas. The E-Cop system is a step toward digitalizing the police station at this time, since everything is going digital. This will bring the public and law enforcement closer together while also enabling communication among all police stations. The E-Cop system allows citizens to report crimes of any kind online to the police station that is closest to them. Every Police Station in this system keeps a general journal, records of crimes and criminal activity, FIRs, and complaints, send the status of complaints, and can view an overview of another police station. Police officers are able to speak with one another. News, notifications, and a plethora of other information are also shown on the system homepage.

Keywords: Criminal, Communication, Digitalizing, Information, Notifications.

INTRODUCTION

"Establishing a data platform that organizations use to receive reports of proximity incidents and provide state-of-the-art police and policing tools [1] will reduce the need for typical assets and enable these authorized offices to reallocate resources to the most desired areas locally." The E-Cop system is a step toward digitalizing the police station at this time since everything is going digital. This will bring the public and law enforcement closer together while also enabling communication among all police stations [2]. The E-Cop system allows citizens to report crimes of any kind online to the police station that is closest to them [3]. Every Police Station in this system keeps a general diary, records of crimes and criminal activity, FIRs, and complaints, sends the status of complaints, and is able to view the general information about another police station [4]. Police officials

---

* **Corresponding author B. Shajahan:** School of Computer Science and Engineering, GB Nagar, Uttar Pradesh, India; E-mail: shajahan@galgotiasuniversity.edu.in

can communicate with each general detail of another police station. Police officers are able to speak with one another [5]. Notifications, news, and a plethora of other information are also displayed on the system's home page [6]. The primary goals of E-Cop are adherence to the Indian Constitution, upholding dignity, compassion, and decency toward citizens, and preserving institutional and personal credibility, [7]. and enforcing law and order equitably and in good faith in order to provide safe and secure protection for all societal segments [8]. Particularly the most vulnerable and defenseless groups are women, youth, the elderly, and minorities [9]. Additionally, we want to maintain racial consistency, recalling popular beliefs based on the majority in our constitution [10], adopting a group-inclusive approach [11]. Human resources enable us to prevent wrongdoings and maintain public control so that we can move forward to assist the public truly.

RELATED WORKS

A more robust online crime reporting system is required due to the rising incidence of crimes involving the Internet [12]. Such an online system, called e-cops, is intended to be a useful tool for reporting any kind of illegal activity. E-cops have potential, but it also has drawbacks [13]. The creation of precise diagnostic models is one of the E-cops' main challenges [14]. These models must enable a smooth user experience and are crucial for assessing the probability of a specific criminal event. One of the primary challenges in creating diagnostic models for E-cops is managing changeable data [15]. Different kinds of data are linked to every type of internet crime [16]. E-cops need to be able to recognize and categorize the data points linked to the reported crime in order to estimate the chance that [17] it will happen again. Additionally, for data to continue being accurate and useful, it must be updated [18]. Secondly, the difficulty of forecasting future criminal activity must be considered while creating diagnostic models for E-cops [19]. Apart from historical trend analysis, more study is required for E-cops models to be effective; advanced techniques for predicting the probability of future events are needed [20]. This calls for an intricate fusion of machine learning data analysis.

OVERVIEW

An online tool for reporting crimes, called E-Cops, was created to make the process of reporting crimes safe and effective. It makes it possible for citizens to swiftly, simply, and safely report criminal incidents online. It gives people a safe place to keep, submit, and retrieve their crime reports. Additionally, it gives the public access to information like the incident's timing and location. In addition, E-Cops acts as a central location for all citizen-submitted crime reports. Law

enforcement organizations receive access to all of the data gathered in order to support their criminal investigations. E-cops provide a plethora of features to guarantee safe and convenient crime reporting. These capabilities include real-time case monitoring, user authentication, safe criminal data storage, and customized report layouts. Law enforcement organizations are able to investigate and settle crimes more quickly and effectively thanks to E-Cops, which also helps in improving the reporting of crime situations safely and efficiently.

PROCESS METHODOLOGY

Planning: Setting up the system is the initial phase in the process. In order to do this, requirements must be gathered, goals must be determined, a budget and schedule must be decided upon, and an implementation strategy must be created. Fig. (**1**) shows the Online Crime Reporting System.
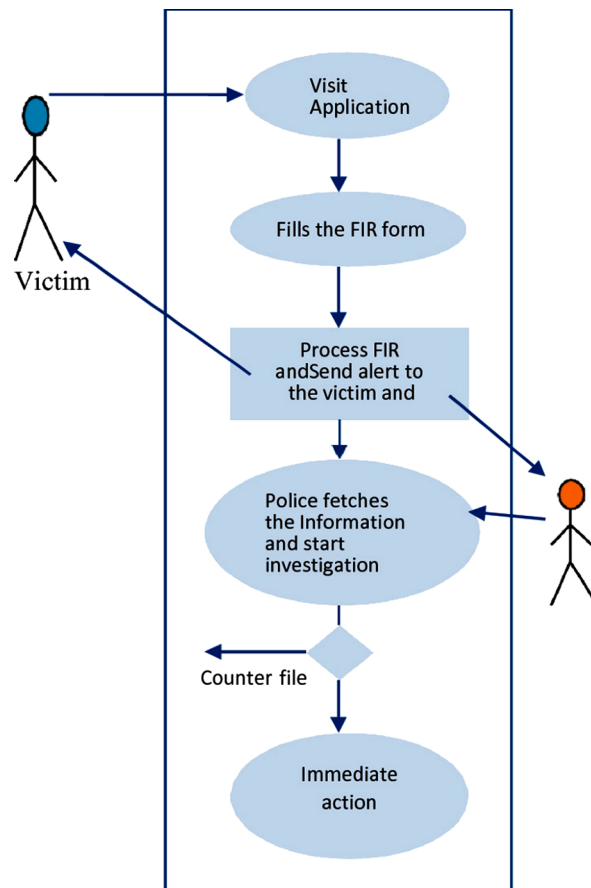
Fig. (1). Shows online crime reporting system.

Diabetic Eye Disease Classification by Residual Network based Feature Mapping with Support Vector Machine

Neha Kapur[1,*] and Bobbin Preet[2]

[1] *CSE, Chandigarh University, Uttar Pradesh, India*

[2] *ECE Department, Chandigarh University, Uttar Pradesh, India*

Abstract: The retinal blood vessels' diameter and tortuosity will alter as a result of diabetic retinopathy. The prediction of differences in retinal blood vessel diameter and new vessel formation is the desired focus of investigation. Segmenting the retinal blood vessels is necessary in order first to observe the alterations. The suggested system improves the quality of the segmentation results over diseased retinal images. A generative and non-generative deep learning model is proposed in this study. The CNN-SVM was separately applied in the experiment. For classification tasks, the CNN-GMM-SVM model that has been suggested does have a sensitivity of 81.0%. When compared to other models, the CNN-GMM-SVM model that has been suggested produces the best outcomes. The CNN-GMM-SVM model increases classification sensitivity by 5.4% when compared to CNN-SVM and CNN-GMM.

Keywords: Classification, Generative deep learning model, Non-generative deep learning model, Prediction, Segmentation.

INTRODUCTION

Classifying diabetic eye illness is a significant issue for the medical community since early identification of the condition might result in effective therapy. Relative networks have proven to be an effective diagnostic tool for a variety of diabetes-related disorders in recent years [1]. This work focuses on automated diabetic eye disease categorization using residual network-based feature mapping and support vector machine (SVM) classification [2]. Residual networks automatically learn picture features, making them effective tools for image processing and feature extraction [3]. The features can be retrieved and mapped into a feature vector either by training the network from scratch or by using the

---

[*] **Corresponding author Neha Kapur:** CSE, Chandigarh University, Uttar Pradesh, India;
E-mail: nehakapur1013@gmail.com

output layers of pre-trained networks. The study's dataset comprises a collection of photos that were taken from websites about eye issues caused by diabetes [4]. Classes linked to diabetic eye illness, including neovascularization, vitreous section, macula, and retinal blood vessels, were then applied to the photos [5]. For automated diabetic eye disease categorization, a pre-trained residual network was used to build a feature vector from the dataset, which was then fed into an SVM model [6]. Based on the receiver operating characteristic curves on the holdout set, the model's overall accuracy was determined to be good [7]. The findings show that feature mapping is based on the residual network.

RELATED WORKS

Due to the rising incidence of diabetic eye illness, diagnostic models for the classification of the condition have received a lot of attention recently [8]. Millions of patients are impacted by the illness globally, and its manifestations include vitreous pathology, macular edema, and retinopathy [9]. The two most important aspects of managing diabetic eye disease effectively are prevention and prompt therapy [10]. Using machine learning models, such as residual network-based feature mapping using support vector machines (SVM), is one method for accurately diagnosing diabetic eye illness [11]. This method uses convolutional neural networks (CNNs) to identify the most pertinent elements from retinal pictures and blood sugar readings. After that, an SVM integrates these attributes to produce a classification model that may be used to recognize and diagnose diabetic eye illness [12]. Like any device learning model, this method has its challenges [13]. For instance, it depends on the availability of reliable data, which could be hard to come by in underdeveloped or rural nations. Furthermore, the model can only be as strong as the data it has access to; thus, finding high-quality datasets is crucial [14]. Ultimately, the model's effectiveness is determined by the quality of its training; poor training might result in inaccurate predictions and subpar performance. The significance of utilizing sophisticated computational models for the classification of diabetic eye illness has been emphasized by recent research [15]. A technique that is becoming more and more popular utilizes residual network support vector machines (SVM) for feature mapping and deep learning [16]. Utilizing convolutional layers, residual networks are deep learning frameworks that offer a high degree of feature learning capability. It is necessary to learn several layers in order to use these networks; each layer can be adjusted for a different purpose [17], such as picture categorization. The learned features are mapped into a label space using support vector machines (SVM) feature mapping. In the end, classification is done using deep learning models [18]. The use of this kind of model to classify diabetic eye illness has the advantage of being more accurate. Record the connection between the labels and the various

aspects. This contributes to improved model interpretability and, consequently, improved classification precision and accuracy [19].

Furthermore, the accuracy of the model is improved by capturing more intricate correlations between characteristics and labels through the use of many convolutional layers [20]. The residual network-based feature mapping combined with the support vector machine deep learning model is a compelling choice for the categorization of diabetic eye illness. It offers the advantages of both shallow and deep learning models and is accurate and efficient.

DIABETIC RETINOPATHY

Diabetes increases the chance of diabetic retinopathy in those who have the disease. Elevated blood sugar levels damage the retina's blood vessels when this happens. They might enlarge and start to leak. Alternatively, they could shut off blood flow by closing. Sometimes abnormal new blood vessels grow on the retina. All of these changes have the power to seize one's view. Diabetes retinopathy does not affect vision until it reaches an advanced stage and is asymptomatic. Diabetic retinopathy is a risk factor for both type 1 (non-proliferative) and type 2 (proliferative) diabetic individuals; hence, screening is necessary.

Diabetic Retinopathy Stages

Non-Proliferative Diabetic Retinopathy (NPDR): This condition represents the early stages of diabetic eye disease. Numerous people have diabetes. In NPDR, tiny blood vessels burst [3], increasing in retinal size. The macula's swelling is known as diabetic macular edema. This is the most common reason why people with diabetes have vision loss. Furthermore, NPDR may cause blood vessels in the retina to collapse. We call it macular ischemia. When that happens, blood cannot reach the macula. Sometimes, tiny particles called exudates form in the retina. Your vision may also be affected by these. Everybody who has NPDR will have a blurry vision. Fig. (**1**) shows the eye with Non-Proliferative DR.

Diabetic Macular Edema

When abnormal blood vessel damage occurs in the surrounding retina, fluid flows into and accumulates in the macula abnormally. This is known as macular edema. Diabetic retinopathy (DR) is a common cause of retinal edema.

Glaucoma

It appears that glaucoma is a condition that can harm the optic nerve, which is found inside the eye. With time, things will only become worse. It frequently

Evaluation of Performance of a Person using Virtual Stock Market

Sachin[1,*], Shreyansh Gupta[1], Uday Tyagi[1] and **Sonia Verma[1]**

[1] *Computer Science ABES Engineering College, Ghaziabad, India*

Abstract: This project's goal was to use research and trading simulations to acquire a fundamental understanding of the stock market. Using suitable investment and technical analysis methodologies along with online simulation tools, investment theory was put into practice. During the simulation, stocks were traded using several tactics. A number of trading techniques' outcomes were analysed and ranked based on profitability. There was also a discussion of each strategy's efficacy. It is obvious that one of the most popular topics these days is the stock market, but what is it really? Sometimes, it needs to be clarified what is intended. The stock market is where? Or is there another possibility? It is an entirely abstract idea for many people. A lot of individuals believe that the stock market and Wall Street are identical to one another. However, Wall Street is the hub of trade and the birthplace of the largest financial market in the world. In actuality, the phrase "stock market" refers to the idea of a system that makes it possible to trade derivatives, other securities, and firm shares. Derivatives are traded on many exchanges, and commodities are exchanged on commodity markets. Most consumers need the resources or financial know-how to trade on stock exchanges. This study aimed to improve people's capacity for learning and their fearlessness. A web-based virtual stock trading system (VST) with integrated financial indicator analysis was created to mimic the stock market. It is anticipated that when students study with objective financial analysis, their mental states will be unaffected by the news, and students who follow market movements can become logical investors.

Keywords: Analysis, Commodities, Identical, Movements, Securities, Tactics.

INTRODUCTION

People are starting to understand the significance of stocks. We may now assist others in developing further in this area [1]. Although more people are becoming aware of investing, some still feel scared [2]. To help alleviate this fear, the

---
** **Corresponding author Sachin:** Computer Science ABES Engineering College, Ghaziabad, India; E-mail: Sachin.19b121036@gmail.com*

market offers a service known as paper trading, which helps to establish a virtual environment. Investing in stocks makes fixed money more valuable and helps create profits for both men and women who spend money on it [3]. The majority of people are ignorant investors with no financial need to understand the stock market. Both irrational and rational variables typically have an impact on the stock market [4]. The stock market has been observed to be impacted by the government, well-known individuals, and occasionally external forces as well. Several locations in India were once the source of the stock market, but the Bombay Stock Exchange and the National Stock Exchange are the only two stock exchanges [5]. There are a lot of paper trading platforms available in India, but most of them need to demonstrate how one may advance or how stock market news can help one invest in stocks [6]. They also do not reward users for successful investments and reaching goals. It follows that investors may make poor decisions if they are not led and may find themselves in danger [7]. We have, therefore, devised a fix for this. As a result, regular retail investors must hone their financial research abilities and make prudent investments in potentially lucrative stocks. Regular investors pick things up quickly on their own, but it takes time [8]. Consequently, this platform fosters an extremely conducive environment for stock trading and assists in paving the way for stock market success. The current climate of the stock market is bad; most of them are commercial, and the average individual needs help to understand them. Many individuals invest in it, but they typically provide less feedback [9]. However, for beginners, feedback is crucial. Additionally, these technologies could be more suitable for instruction in financial management. In addition to serving as a tool for instructors to evaluate their students' investments and learning outcomes, the virtual stock trading system presented in this study allows students to analyse the financial parameters of specific stocks in order to help them choose equities that may be successful [10]. We offer instruments for evaluating investment performance that assists you in comprehending the accurate idea of creating a website centered around the virtual stock trading system (VST) in order to draw in students [11]. Acquiring knowledge about stock management and associated topics, as well as utilizing a virtual setting promotes interactive learning and instantaneous stock trading [12]. Implementation tools are used to as models for key figure analysis and performance evaluation of investments [13]. Students would benefit from learning how to make profitable investments. Students should be able to evaluate the financial ratios of certain potential equities before trading once they have grown accustomed to the VST technique [14]. By doing this, you can either profit from your investment or lower the risk [15]. VST systems have shown to be helpful tools for researching individual investors' trading patterns and other financial concerns.

RELATED WORKS

Evaluating an individual's success in the virtual stock market is an extremely difficult assignment [16]. The performance assessment of an individual in the virtual stock market ought to be able to precisely gauge the trading tactics of a user, given the constantly shifting financial landscape [17]. In order to accomplish this, current computational models have been created that can swiftly and correctly calculate an individual's stock market performance. The neural network or backpropagation model is the first one. The foundation of this model is supervised learning [18]. It gradually refines a user's holdings in the virtual stock market and then utilizes what it has learned from the past to forecast the user's stock market performance in the future. For stock market applications, the backpropagation model is a powerful computational tool [19], since it can forecast the future performance of the stock market with greater accuracy than conventional techniques like regression analysis. The random forest model is the second model. In order to categorize a person's stock market positions into one of three groups—progress, stasis, or deterioration—this technique requires building a forest of decision trees [20]. More quickly and precisely than using traditional methods, the random forest model may ascertain an individual's current stock market performance by grouping their positions into these three groups.

LITERATURE REVIEW

Stock Trading Actions

As a result of a lack of knowledge, investors are biased to purchase well-performing equities, more shares of stocks they already hold, and previously owned stocks at discounts to recent sales prices due to psychological factors. To purchase eminent stocks, *etc.*, retail investors can also view their prior investments and draw lessons from past blunders. Investing enthusiasts frequently overlook the risks associated with aggressive stock trading. Those who invest understand that they must purchase at a discount and sell at a premium. The observations above imply that when trading stocks, investors would not be able to make logical selections. Reducing negative emotional impact enables investors to make more logical decisions while trading stocks, which boosts earnings. Digital media are crucial, particularly for individuals. Investors sharing information about stocks and finance affect stock prices and investors' choice of investments. Media outlets, including digital and print ones, typically focus on investors. In the market, individual investors are primarily common. We depend on the most recent news, yet we miss out on important details that could lead to more in-depth research. These uninformed investors frequently make wrong decisions as a result

GIS Mapping of High Sewage Areas in India and Sustainable Design of Sewage Disposal System

Sachin Kumar[1], Manish Kumar[1] and **Shreeja Kacker[1,*]**

[1] *Department of Civil Engineering, Greater Noida Institute of Technology, Greater Noida, U.P., India*

Abstract: The current study focuses on designing sustainable sewage disposal systems for high-sewage locations in India by using ArcGIS software for GIS mapping. The study maps and examines the spatial distribution of sewage and disposal across the nation using ArcGIS software, which integrates data from multiple GIS sources such as census information, satellite images, and municipal records. The performance of the current sewage disposal systems in high-sewage locations in terms of upholding environmental and public health requirements is examined and evaluated in this article. Of the sewage generated in India, more than 62,000 million liters per day (MLD) are processed, according to the Central Pollution Control Board (CPCB) (2019). Water bodies receive the discharge of untreated sewage and pose a serious risk to human health and water pollution. In high-sewage locations—urban slums and peri-urban areas, for example—where sewage treatment infrastructure is either non-existent or insufficient, the situation is terrible. The study uses GIS mapping techniques to locate high-sewage regions in India using ArcGIS software. Then, it examines the features of these places, including socioeconomic level, housing conditions, and population density. According to the research, places with high sewage levels are primarily found in metropolitan and peril-urban regions that have dense populations and inadequate sanitary infrastructure. In high-sewage locations, the study also shows that the current sewage disposal systems are mostly insufficient and need to be upgraded in order to comply with environmental and public health regulations. The study suggests a sustainable sewage disposal system design for a specific Greater Noida high-sewage area that combines social and technical sewage management. In order to treat sewage at the source and lessen the strain on the centralized treatment plants, the design makes use of decentralized sewage treatment systems, such as septic tanks and anaerobic digesters. The design also places a strong emphasis on the use of affordable and energy-efficient technologies. The study concludes that because the suggested sustainable design incorporates the local community's active engagement in the sewage treatment process, it is both socially and economically acceptable.

Keywords: Affordable, Design, Economic, Infrastructure, Treatment.

* **Corresponding author Shreeja Kacker:** Department of Civil Engineering, Greater Noida Institute of Technology, Greater Noida, U.P., India; E-mail: shreeja.ce@gniot.net.in

INTRODUCTION

In India, more than 60 million tonnes of waste are generated every day, of which 45 to 50 million tonnes are left untreated. The metros themselves produce ten million tonnes of waste per day. By 2040, it is predicted that metropolitan India alone will generate around 170 million tonnes of waste annually [1 - 3]. Nevertheless, India has one of the poorest sewage systems in the world, despite the country producing enormous amounts of trash. Trash disposal is common on public roadways. In India's rural areas, open defecation still happens because millions of houses lack toilets. Regardless of the harm it does to the environment, spitting and urinating in public are common practices for millions of individuals [4 - 6]. Numerous actions propagate illness, increase squalor, and worsen the country's health. India may become a healthier place to live, lower the rate of illness, and drastically lower the cost of medical care by abstaining from certain behaviours [7].

If we wish to make India clean, we must alter the way we think about cleanliness and instill it in our actions. To achieve this, there is a national campaign called the Swatch Bharat Bahaman. The topic of discussion includes public communication campaigns aimed at increasing public awareness and promoting healthy behaviours. Additionally, it covers the building of alternative infrastructure, including sewage and waste disposal systems, recycling plants, toilets, *etc.*, to eradicate unhealthy activities [8 - 10]. Despite government efforts, India leads the globe in open defecation despite having few toilets in rural areas, according to a UN audit. Urban India produces 1.88 lakh tons of solid waste every day, or 68.8 million tonnes annually, according to official estimates [11]. By 2041, this amount is expected to rise to 16 million tonnes. Thirty percent of garbage in urban areas still needs to be processed. More than two million people, most of them children, die from diseases caused by a lack of access to clean water, inadequate sanitation, and inadequate hygiene every year [12]. People in urban areas discard rubbish and debris on the ground, the sidewalks outside their homes, and the streets instead of using dustbins [13 - 15].

RELATED WORKS

High sewage regions are a significant contributor to environmental pollution in India, endangering public health and compelling governments to implement necessary corrective measures. As a result, these places must be managed properly if sustainable development is to occur. Thus, in order to create a Geographic Information System (GIS) for India's high-sewage areas, a systematic strategy for monitoring and gathering pertinent data is desperately needed [16]. Recent developments in computing technology have made it possible to create

computationally complex GIS mapping, which provides precise information about the locations of high sewage areas. High-resolution satellite imagery is the main source of information used in this type of GIS mapping to locate possible contamination sites [17]. High-quality pictures give a thorough picture of the geography, terrain, land cover, population distribution, and other environmental characteristics. Empirical data from earlier research and observations about water contamination are then superimposed on top of this picture [18, 19]. This GIS mapping will enable the development of sustainable and economical strategies for resource identification and allocation, which will significantly lower the number of high-sewage locations in India. For example, the geographic areas could be prioritized such that only particular places are targeted for the installation [20].

LITERATURE REVIEW

According to Scott *et al.*, the majority of developing countries routinely dump untreated urban sewage into open bodies of water. As a result, there may be a negative impact on both public health and the sustainability of agriculture. The amount of rubbish that the Indian city of Hyderabad dumps into the Music River was the subject of research, and between December 2003 and January 2005, a 14-month water quality evaluation was carried out. The survey found that the quality of river water significantly improved with increasing distance from the city. It was recommended that health protection measures be put into place, such as regular anthelmintic medication programs, improvements to the local water supply, and cleanliness. In their paper, Patel *et al.* found that household wastewater contains organic and inorganic particles in suspended, colloidal, and dissolved forms. Wastewater produced in urban areas is a result of industrial and home activities. Illampu is one of the small cities in the Maharashtra area of India that lacks a suitable drainage system. All household wastewater is currently disposed of either in an open sewer or in a public area close to a residence. To aid in future research, this study maps the primary and subsidiary subsurface collection systems using geographic information systems (GIS). The creation of an effective collection system for Illampu town is its aim. The study by Mini *et al.* looks at human health, aquatic toxins, environmental consequences, and sewage disposal methods. Emphasis is placed on the consequences of releasing various pollutants into aquifers and water bodies, which may make the water unsafe for drinking or other domestic or recreational uses. Subramanian *et al.* highlighted that the lithology of the Chennai region, along with rapid horizontal and vertical expansion, is the primary cause of flooding in urban regions, especially during monsoon seasons. Urban storm waterhas an impact on the lifespan of urban facilities.

iGot Garbage

 Tushar[1,*], Varun Upadhayay[1], Shruti Gupta[1] and **Vartika Srivastava[1]**

[1] *ABES Engineering College, Ghaziabad, India*

Abstract: The current waste disposal system in India collects unsorted waste from residences; the daily growth in garbage overwhelms the bins placed in public spaces within towns. The process of manually sorting waste is labour-intensive, inefficient, and only sometimes practical because of the volume of waste. Consequently, the concept of "The Smart Waste Management System, an embedded system comprising three smart bins with contemporary sensors, microcontroller, LCD panel, and Wi-Fi modules," is explained in this article. We developed a system that uses a sensor to identify trash, opens the target trash can's lid, determines how much trash is there, and then automatically opens and closes the lid. Upon reaching either the average or maximum level, an alert will be transmitted.

Keywords: Microcontroller, Smart waste management system, Sensors, Unsorted, Waste, Wi-Fi modules.

INTRODUCTION

The UN estimates that by 2025, there will be 8 billion people on the planet, with a 20% increase in population. By 2023 [1], India is expected to have the densest population of any nation, with 1.5 billion people living there by 2030 [2]. There is another issue that arises with this population growth and needs to be handled [3]. One of the main issues facing developing nations is garbage [4]. There are images of trashcans overflowing and garbage shooting out of them everywhere you look [5]. The World Bank has issued data indicating an increase in the rate of garbage generation [6]. Around 1.3 billion tons of solid trash was produced by cities worldwide in 2012. This means that each person produces 1.2 kg of garbage every day. Cities generate an excessive amount of waste as a result [7]. But there is trash in many metropolitan locations. Containers are open for public use [8]. The ecology will, however, continue to deteriorate daily without proper upkeep, which would have grave consequences for humanity [9]. We see images of overflowing trash cans, which is frequently dangerous since it breeds a wide range of insects

*Corresponding author Tushar: ABES Engineering College, Ghaziabad, India; E-mail: tusharchaudhry1@gmail.com

and mosquitoes and causes several diseases. Garbage management must be done correctly to reduce threats to patients' health and safety as well as those of the general public and the environment [10]. This includes managing and disposing of garbage properly, transporting it, and assembling it. Waste must be sorted in order to be valued economically [11]. But as of right now, there needs to be a system in place for separating rubbish. A modern, sustainable waste management system must be put in place to replace the ineffective system in place now [12]. Such a mechanism is suggested in Fig. (**1**). It alters waste segregation systems using the Internet of Things (IoT) as a key instrument to offer affordable, user-friendly, and efficient solutions to some or all of these issues [13].
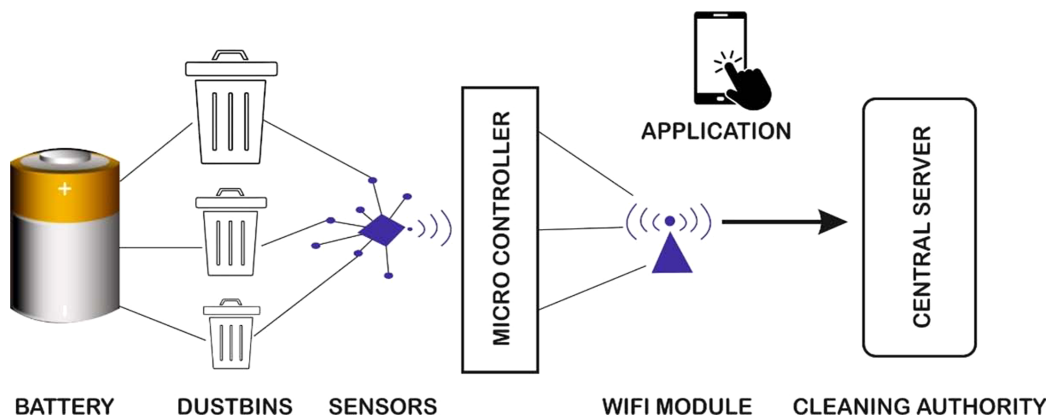
Fig. (1). IoT based SWMS.

Our technology uses smart bins that are internet-connected to collect real-time data. This study offers a really technological solution for maintaining environmental cleanliness [14]. The device keeps an eye on the trash cans, gathers data on the amount of waste there, and finally transmits it to the network for system analysis and necessary decision-making [15]. This will enable us to improve the efficacy of the cleaning systems that are now in use in our nation. One benefit of this activity is that the waste has a great potential for recycling, which lowers the occupational dangers for the people who sort the waste. The goal is to empty the garbage before it gets too full and to overflow it. This study increases the system's capabilities by lowering fuel (energy) usage.

The following lists the sections that make up this paper and how they are used:

• To find pertinent theories, methodologies, and gaps in the literature that can be utilized in a paper, thesis, or dissertation, a literature review entails looking

through academic materials that are relevant to a particular subject. It offers a summary of the body of knowledge in the area and can direct further investigation.

- Existing System describes how models and pre-existing systems that have been designed or put into use to achieve the relevant goal operate.
- The output produced by the proposed system is valuable to the user. It serves to showcase our solution for the specified issue as well as our model that that we're going to present.
- The methodology section describes the procedures used to conduct the study. This makes it possible for readers to assess the accuracy and dependability of the process.
- Working outlines the paper's detailed analysis, its operation, and all of the work covered under it for the provided topic.
- A flowchart is a graphic that uses diagrammatic representation to illustrate the movements and actions within a complex system.
- Future scope outlines the improvements and potential solutions we may make to the given situation in the near future.
- A research paper's conclusion is when everything is logically brought together.

RELATED WORKS

Computational models have been employed in the fight against waste management in recent years [16]. The iGot Garbage app, in particular, aims to streamline and improve trash management. The software helps users keep organized and informed about their waste removal efforts [17]. By making it simpler to track the disposal of recyclables and trash, it also aids in the development of more enduring garbage disposal practices. Several computational models are used by the iGotGarbage app. Its most basic feature is predictive analytics, which assists customers in foretelling which materials will be recycled or require disposal [18]. Based on existing waste management practices, these prediction models let consumers plan ahead and determine which things will be recycled [19]. The web-based data dashboard is another feature of the iGotGarbage app, in addition to predictive analytics [20]. Against regional and international standards, users can track and compare their waste disposal practices with the aid of this dashboard. Users can get information on their waste removal activities through the dashboard, including total garbage created, recyclable materials, and compostable products. Users can use this information to gain a better understanding of how their waste management actions affect the environment.

Examining the Viability of Integrating Blockchain Technology into IoT Devices for the Supply Chain

Anubhav Sharma[1], Ashish Pandey[2], Ramander Singh[3] and Ankit Garg[4,*]

[1] *Computer Science and Engineering, IMS Engineering College, Ghaziabad, India*

[2] *School of Computer Science & Application, IIMT University, Meerut, Uttar Pradesh, India*

[3] *Computer Science and Engineering, Amity University, Haryana, Uttar Pradesh, India*

[4] *Management Department, Ajay Kumar Garg Institute of Management, Ghaziabad, Uttar Pradesh, India*

Abstract: Decentralized solutions with many benefits over centralized systems are something that blockchain and IoT can provide. IoT devices may guarantee the accuracy and dependability of their data by utilizing the blockchain's fault tolerance, security, and data transparency. However, there are difficulties when implementing blockchain in IoT systems, particularly with consensus procedures. Due to their confined computation, connectivity, and battery capacity, IoT devices with limited resources may find it challenging to reach a consensus on the same ledger state.

A recent paper suggests an empirical method for implementing blockchain in supply chain scenarios to overcome these issues. The report also proposes a customized Raft consensus algorithm for use with the Hyperledger permissioned blockchain. Each transaction in this updated protocol is sent to a leader node before being relayed to follower nodes in order to prevent a bottleneck from affecting the system's scalability and throughput. The supply chain context is one where this strategy can be especially useful.

Overall, the paper addresses some of the issues related to consensus protocols while highlighting the potential advantages of combining blockchain and IoT in supply chain contexts. By assuring data integrity and eliminating fraudulent actions, this technique can make managing supply chain data more secure, transparent, and effective.

Keywords: Blockchain technology, IoT devices, mRAFT, Supply chain, Transaction execution flow.

---

[*] **Corresponding author Ankit Garg:** Management Department, Ajay Kumar Garg Institute of Management, Ghaziabad, Uttar Pradesh, India; E-mail: drankitgarg108@gmail.com

INTRODUCTION

The daily lives of people and corporate activities are changing as a result of the Internet of Things (IoT), a rapidly developing technology [1]. IoT systems are evolving from automatic to autonomous, where intelligent devices can learn from their environment and make decisions on their own, as intelligent computing units continue to spread. A new era of intelligent systems that are altering the digital world is being brought about by this change [2].

IoT devices are now commonplace and employed for a variety of purposes, including supply chains, healthcare, smart grids, and transportation systems [3]. Making wise decisions depends on the precision and purity of the data these devices produce [4].

The typical IoT network architecture, which employs a centralised client-server strategy and a cloud backbone network, has a number of drawbacks, though. This architecture is ineffective for managing and controlling a large number of IoT devices because it involves a significant amount of overhead to manage the varied range of heterogeneous devices that must interact in a delay-critical way. The centralised architecture's single point of failure renders it susceptible to system failure, hampers communication amongst IoT devices, and makes it expensive to operate and maintain [5].

For IoT network infrastructure control, a decentralised, fault-tolerant, secure, and highly scalable approach is needed to get over these limitations. Blockchain technology provides a system that is highly fault-tolerant, secure, transparent, traceable, and scalable and gives all of these benefits [6]. There is no need for a central authority because existing nodes in a peer-to-peer network confirm transactions.

In conclusion, IoT devices and their data can be effectively and dependably controlled using blockchain technology. This technology circumvents the drawbacks of traditional centralised IoT network design by offering a decentralised, fault-tolerant, secure, and scalable approach for controlling IoT network infrastructure [7].

RESEARCH REVIEW

In this essay, the limits of the current IoT device networks are examined in relation to the promise of blockchain technology. It starts with a thorough analysis of earlier studies in this area, highlighting the advantages and disadvantages of various blockchain-based consensus methods for IoT. The second section introduces mRAFT, a new consensus technique that makes use of idle follower

nodes to speed up throughput and cut latency in blockchains that support the Internet of Things. The effectiveness of the algorithm is demonstrated through a case study of supply chain management employing blockchain technology [8-10].
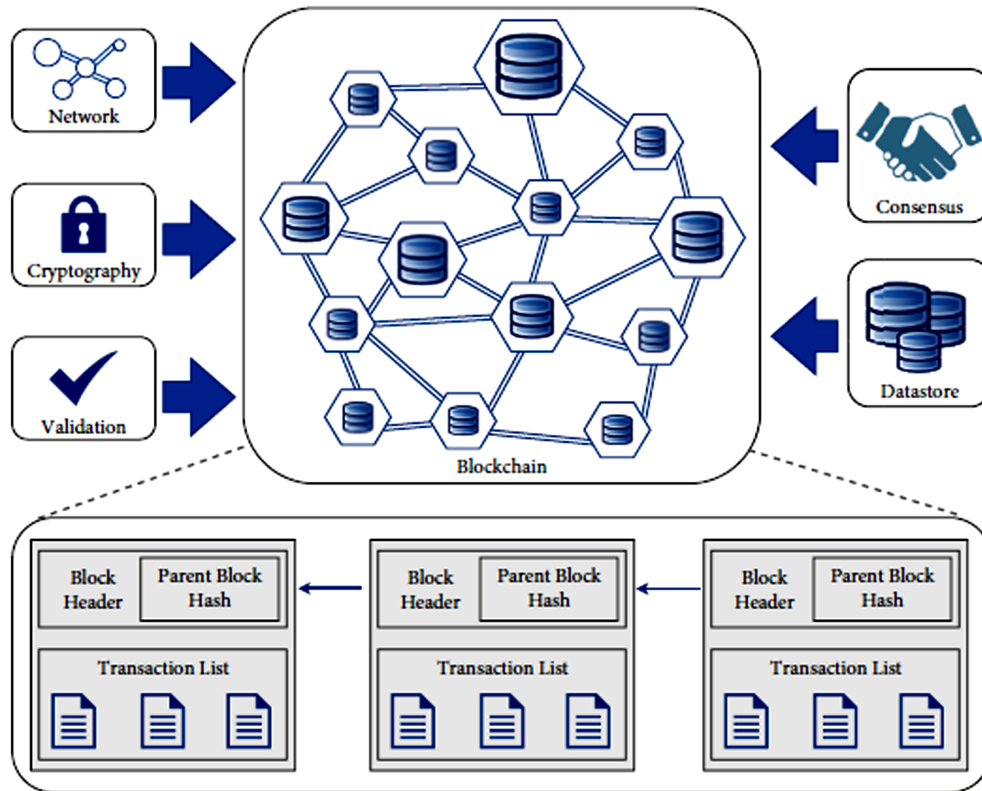
Fig. (1). Basic components of a blockchain architecture.

The essay also emphasizes the need for additional study to overcome performance snags and other problems with blockchain-enabled IoT [11-15]. The necessity for all nodes to execute smart contracts, the execution of non-deterministic smart contracts, and rigid consensus procedures are only a few of the restrictions of current permissioned blockchain frameworks that are explored (Fig. **1**). The use of gas to control nondeterminism in smart contracts on open blockchains is also explored in the paper [16, 17].

CHAPTER 9

Blockchain-Based Secure Storage for IoT Management with Edge Computing

Ramander Singh[1], Anubhav Sharma[2], Ashish Pandey[3], Satish Kumar[4] and Ankit Garg[4],*

[1] *Amity University, Haryana, Uttar Pradesh, India*

[2] *IMS Engineering College, Ghaziabad, India*

[3] *School of Computer Science & Application, IIMT University, Meerut, Uttar Pradesh, India*

[4] *Management Department, Ajay Kumar Garg Institute of Management, Ghaziabad, India*

Abstract: As blockchain is used in applications like smart grids and healthcare systems, its significance as a management tool for decentralised systems is becoming clearer. However, its application on mobile devices with constrained resources is restricted because of its high resource requirements and poor scalability with frequent, intense transactions. To get around this restriction, mobile devices can use edge computing to outsource their mining operations to the cloud, which offers scalable and secure transactions with reliable access, dispersed computing, and unaltered storage. Key issues including security, scalability, and resource management must be solved to successfully combine blockchain with edge computing. Flexibility, anonymity, and integrity issues still need to be investigated for the development of a useful and secure decentralized data storage system, even if researchers have explored the relevant architectural criteria and included several specific applications.

Keywords: Blockchain, Edge computing, IoT, Peer-to-peer, Security.

INTRODUCTION

Blockchain has recently attracted a lot of interest as a platform that makes use of community validation to synchronize the data in many users' replica ledgers (Conoscenti, Vetro, & De Martin (2016)) [1-5]. Blockchain surpasses alternatives built on centralised digital ledgers as a decentralised ledger that verifies and records transactions. Blockchain technology stores data records as blocks, with logical links listed as a linked list of chained-together blocks (Feng, He, Zeadally, Khan, & Kumar (2018)). In order to create a tamper-proof platform for data storage and exchange, the consensus process replicates changes to data blocks

* **Corresponding author Ankit Garg:** Management Department, Ajay Kumar Garg Institute of Management, Ghaziabad; E-mail: drankitgarg108@gmail.com

across the network (Garg, Agarwal, & Singh (2023)). Blockchain-based automatic data transfer decreases the requirement for outside involvement by facilitating a paradigm shift from centralised to decentralised administration. Its applications have grown to include smart grid, medical, delivery, and logistics systems, despite being primarily developed to address Bitcoin's double-spending difficulties (Garg & Kumar (2021)). However, its two biggest drawbacks are its low capacity for expansion and acceptance of occupations with high frequency (Garg & Kumar (2022)) [6-10].

For platforms like the Internet of Things (IoT), which connects countless physical things to the Internet, the security properties of blockchain may make it simpler to design privacy-preserving apps. The Internet of Things (IoT) is a huge network of linked devices that can exchange data *via* the Internet, generate enormous amounts of data, including sensitive data, and speak with one another [6]. Peer-t--peer (P2P) privacy may be preserved in these networks thanks to block blockchain's decentralised nature without compromising the security of shared data. However, it is difficult to use blockchain directly in IoT and other mobile applications due to the significant resource consumption during the mining and consensus procedures and the limited resources of IoT nodes (Feng, He, Zeadally, Khan, & Kumar (2018)) [11-15].

According to the hypothesis, mobile edge computing enhances the integration of blockchain into IoT systems and offers an alternate approach to problems with proof-of-work (PoW). In order to deliver resources and services, edge computing is a cutting-edge technology that makes use of both the network edge and the cloud (Garg, Singhal, Das, & Gaur (2022)). Through a variety of access points, users have access to features similar to those found in the cloud, such as greater processing power, application space, and storage. This makes it possible for mobile devices with limited resources to increase their processing power by delegating mining and storing operations to edge servers. A decentralised ecosystem for outsourced computation and safe storage for scalable and secure transactions is created by combining blockchain with edge computing. The biggest barriers to implementing this combination, however, continue to be security worries and edge computing's distributed management (Garg & Singhal (2015)).

Similar Works

Using safe cryptographic methods, the blockchain is a secure system that generates a decentralised electronic record made up of a number of chronologically related transaction blocks (Garg & Singhal (2016), Garg, Tripathi, Agarwal, Tomar, & Kumar (2023)). Blockchain guarantees that

authorized transactions are transferred and preserved tamper-proof by requiring nodes in a P2P network to keep immutable and publicly verifiable records (Garg, Agarwal, & Singh (2023)). Using a predetermined consensus method, network participants must concur on a transaction in the same order that it is validated before it can be added to the blockchain (Garg & Singhal (2016)). A network architecture known as the Internet of Things (IoT) enables data to be exchanged between data centres and actual physical objects like actuators, sensors, cars, and other intelligent devices (Xiong, Zhang, Niyato, Wang, & Han (2018)). IoT makes it possible for various pieces of hardware and software to communicate with one another by promoting a heterogeneous environment. Smart grids, smart healthcare, and smart transportation are just a few of the applications that can benefit from the Internet of Things (IoT) devices that are continually being integrated into their surroundings and implanted with inexpensive sensors. According to the term's definition, mobile edge computing (MEC) offers an IT service environment and cloud computing capabilities near mobile users at the edge of the mobile network, inside the Radio Access Network (RAN), and close to the mobile network. This new paradigm has emerged as a result of the quick development of technology, which has led to the "edge" of the mobile network serving as the new location for previously cloud-based services and applications (Garg & Singhal (2015)). Traditional centralised cloud computing is no longer able to offer many applications the required quality of service (QoS) due to the growing use of mobile devices.

Current Research Work

Blockchain can offer secure storage and verified transactions for IoT devices, according to a study by (Vukolić (2015)). Finding an appropriate hosting environment, however, is the biggest obstacle to integrating blockchain with IoT devices. According to the authors, cloud computing may offer more deployment benefits than fog computing. A prototype for integrating blockchain technology into low-resource mobile devices *via* edge computing was shown by (Kim & Jeong (2018)) in a different study. Their findings demonstrated that when additional miners join the network, this integration could benefit both service providers and miners. (Kubendiran, Singh, & Sangaiah (2019)) suggested a resource allocation method based on edge computing to make it simpler to integrate blockchain into transcoding video streaming systems. To ease the burden of transcoding operations in an edge computing environment, they developed a system of incentives and tried two different approaches. Through resource dumping and adaptive allocation tactics, simulation results have shown that the approach could maximize average revenue.

CHAPTER 10

A Review of Applications Combining Blockchain Technology with Artificial Intelligence

Ashish Pandey[1], Ramander Singh[2], Anubhav Sharma[3], Pragya Agarwal[4] and Ankit Garg[5],*

[1] *School of Computer Science & Application, IIMT University, Meerut, Uttar Pradesh, India*

[2] *Amity University, Haryana, Uttar Pradesh, India*

[3] *IMS Engineering College, Ghaziabad, India*

[4] *Hi-Tech Institute of Engineering and Technology, Ghaziabad, India*

[5] *Management Department, Ajay Kumar Garg Institute of Management, Ghaziabad, India*

Abstract: The adoption of AI and blockchain paradigms is moving very quickly in the market. Although each has its own advantages, there are differences in the complexity and the level of innovation. Automated payments in the digital age are possible thanks to blockchain technology, which also ensures the secure, decentralized transmission of information, documents, and personal data. At the moment, blockchain and artificial intelligence are the two technologies that are most frequently discussed. Blockchain can automate Bitcoin transactions, providing users with decentralized, trustworthy, and secure access to a shared ledger of transactions, records, and data. Smart contracts on the blockchain can also control user behaviour without the need for centralized administration. AI, on the other hand, gives robots intelligence, cognition, and decision-making capabilities similar to those of humans.

This insight has led to a thorough analysis of the blockchain and AI advancements that have occurred between 2012 and 2022. A review of 121 articles from the past ten years that evaluate the present status of blockchain and AI technology and support its use in a variety of sectors has been done. This study's main objective is to examine how these two technologies have been integrated. Additionally, the focus has been shifted to examining the shortcomings, gaps, and problems of this combination through literature research in the field.

Keywords: Artificial intelligence, AI applications, Blockchain technology, Critical analysis.

---

* Corresponding author Ankit Garg: Management Department, Ajay Kumar Garg Institute of Management, Ghaziabad, India; E-mail: drankitgarg108@gmail.com

INTRODUCTION

A well-liked decentralized ledger system with many uses is the blockchain. It has been regarded as a potentially revolutionary idea since its creation in the 1920s, with the potential to alter how people communicate, automate payments, monitor markets, and record transactions. Each mining node cryptographically hashes and verifies every transaction on the blockchain, which could eliminate the need for a central authority to oversee and verify transactions between various parties [1, 2]. As a result, time-stamped records are created, which are secure, permanent, and open to the public.

Another area of interest that is expanding quickly is artificial intelligence (AI). According to recent estimates, the AI sector might be worth USD 13 trillion by 2030 [3]. This is not the case yet, despite the fact that a number of competing technologies aim to make data in smart homes attack-proof. One of the most promising strategies for defending the home network from command and control attacks on encrypted data and offering a secure connecting point for all networked devices is the development of blockchain technology [4].

It is challenging to carry out a control attack on data that is being kept or sent across a single exchange because the nodes in a blockchain come to an agreement to ensure that every transaction is permanently documented. Combining these two technological developments, the idea of decentralised AI has gained popularity recently [5]. Decentralised AI offers a solid framework for safeguarding the vast volumes of data necessary for AI to operate, enabling distributed, intermediary-free execution and archiving of trustworthy, precisely labelled, and shareable data on the blockchain [6].

A blockchain can be used to construct smart contracts, which let trusted third parties manage who can access and share user data. After being exposed to an autonomous system, machine, and varied settings, they can adapt and learn, resulting in decision-making outputs that are accurate and dependable that are recognized by all blockchain mining nodes [7]. Everyone with a stake in the outcome can rely on and support such judgements. To determine the optimal methods for enhancing security and confidence in data interchange and decision results, independent operators can take part in, organise, and vote on future decisions [8].

RESEARCH TECHNIQUES

The research questions are:

1. What is the current state of science?

2. Which sectors stand to benefit from the convergence of blockchain and AI technology?

3. What uses do AI and blockchain have?

4. What challenges are presented by blockchain and AI technology?

RESEARCH APPROACH

A broad viewpoint was required to perform a thorough analysis of the literature. To assure the accuracy of the data shown here, sources from Scopus were examined frequently, and pertinent databases underwent thorough analysis. For a variety of reasons, not all well-known literary works were included in the search parameters, necessitating a thorough literature assessment. A total of 353 Scopus results were examined; 121 of them stood out as being especially pertinent. The search phrase was created with the specific research topics and study domain in mind, and suitable results were found by searching for "Artificial intelligence" or "AI" AND "blockchain" [9, 10].

SELECTION RESULTS

A total of 353 artefacts were discovered throughout the search, and this critical evaluation closely analyzed 232 of them. The final selection consists of 121 articles mentioned below, along with a summary of the most important conclusions from the classification. To assure the accuracy and relevance of the material offered here, a thorough study of the literature was conducted. For a variety of reasons, several well-known literary works were left out of the search parameters, and the study domain and research topics had an impact on how the search string was put together. Searching for "Artificial intelligence" or "AI" AND "blockchain" produced the most pertinent results [11] (Figs. **1** and **2**).
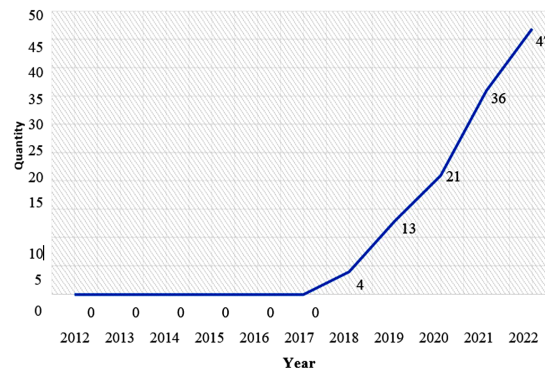
Fig. (1). The Number of annual publications between 2012 and 2022.

Decentralized Application for Fundraising in Healthcare Using Blockchain Technology

Shikha Jain[1,*], Deepanshu Singh[1], Yashraj Mishra[1] and **Yash Modi[1]**

[1] Kiet Group of Institutions, Delhi-Ncr, Ghaziabad, Uttar Pradesh 201206, India

Abstract: The advancement of contemporary technologies has provided individuals and organizations with the means to gather financial resources in order to meet their health-related requirements. The finance framework for addressing health-related requirements is centralized, with a single governing body making choices on behalf of everyone. However, this centralized approach often results in inefficiencies and trust concerns. Tracing the entire system is crucial in order to address the trust issue, which has a negative impact on the process. In this study, we implement a mechanism that empowers each individual to independently collect funds and carry out their operations, thereby eliminating the control exerted by the inefficient central institution. This facilitates fundraising in the health industry with more transparency, providing donors with exact visibility into how funds flow from the donor to the beneficiary. This utilization of the public and unchangeable characteristics of blockchain enhances efficiency.

Keywords: Advancement, Independently, Inefficient, Mechanism, Organizations, Technologies.

INTRODUCTION

Evidently, there has been a decline in public confidence in fundraising efforts for the health-related needs of individuals or organizations. Data reveals that the percentage of donations made by Americans in these areas has decreased from 66% in 2000 to 53% in 2016. We have come to recognize the considerable authority vested in a central institution, enabling them to exercise unrestricted control. It undermines the purpose of fundraising in the healthcare sector. Blockchain provides an alternate means for individuals to have control over the monitoring of the entire process. It empowers individuals at lower levels of the hierarchical structure by granting them greater authority and autonomy. It enables

---

[*] **Corresponding author Shikha Jain:** Kiet Group of Institutions, Delhi-Ncr, Ghaziabad, Uttar Pradesh 201206, India;
E-mail: shikha.jain.cse@kiet.edu

them to seek funds for healthcare needs actively. Decentralization is a powerful mechanism that ensures equality for all individuals, eliminating the need to depend on a single dominant entity that may unfairly receive the majority of support, even if it may not be the most beneficial option. It is feasible to employ a mechanism to eradicate biases that may exist in the centralized domain. It provides a greater number of individuals with the chance to secure the necessary finances to treat their health-related ailments. This will result in human advancement and will continue to expand at an accelerated pace. It highlights the necessity for a traceability program that utilizes modern technology to enhance transparency in the fundraising process for healthcare. The study introduces a novel approach to healthcare fundraising, utilizing decentralization as a means to achieve the desired goal. Fundraising is gaining popularity as a means to generate finances. The government is providing support for these efforts as well. The removal of the banking system from the entire process simplifies the operation. It is efficient. It is an effective method to contribute to the well-being of individuals. The platform is indifferent to caste or gender. The program reduces search and transaction costs, hence enhancing people's engagement in healthcare campaigns. Public misuse can occur due to the absence of a regulatory authority. Money laundering or fraud might occur due to the absence of a centralized authority. Transparency and accountability can be attained. The primary objective is to ensure that the funds are delivered directly to the intended destination without the intervention of intermediaries. Documentation is essential to prevent the misuse of funds. Blockchain technology is utilized for digital transactions due to its immutable ledger properties (see picture Fig. (**1**).
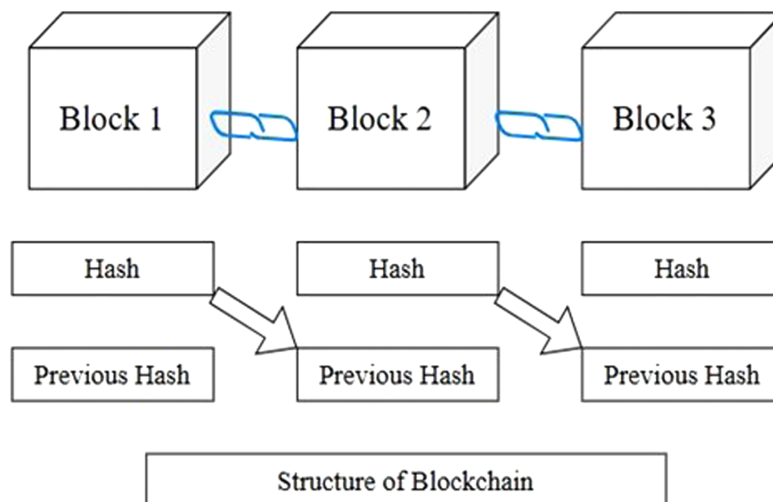
Fig. (1). Structure of blockchain

LITERATURE REVIEW

Irma Latif Atul Laily, Oman Kamrudin, Suci Fadhilah, and Ade Azurat utilized Information Technology to enhance the efficiency of the charity organization in 2018. It was carried out for the Indonesian population. The charity organizations were either small or unregistered and needed more resources. Information systems can significantly cut expenses. Their objective is to develop innovative methods for leveraging information technology to enhance the value provided by charitable organizations [1].

Shang Gao, Daniel Macrinici, and CristianCarto are individuals. In the year 2018, smart contracts provide a high level of customizability to transactions. This characteristic has been applied in various domains, such as banking, healthcare, voting, and energy resources. Smart Contracts continue to provide hurdles for developers, users, and organizations. Essentially, they have discussed the issue and its respective resolution concerning smart contracts [2].

Shweta Jain and Rahul Simha (2018) proposed the implementation of a distributed ledger application to enhance social welfare by incorporating attributes such as adaptability, transparency, and accountability. Here, the donors stipulate a condition for their donation. It is intended for recipients who have expressed interest. It is accomplished by distributed consensus. Subsequently, there is a retrograde movement that returns to the donor, providing information on how their funds are allocated. It fosters responsibility and openness [3].

The authors of the publication (2019) are Aiste Rugeviciute and Afshin Mehrpouya. The study aimed to gain a comprehensive grasp of blockchain in order to ascertain the true capabilities of this technology. The study primarily relies on reports and discussions. Improving the transparency of cash flow in the finance sector has been discovered to decrease administrative expenses [4].

In 2019, HadiSaleh, Azamat Dzhonov, and Sergey Avdoshin suggested a "Platform for Tracking Donations of Charitable Foundations Based on Blockchain Technology." They highlighted the need for more transparency in how donors' funds are utilized, leading to trust concerns. The primary objective is to consolidate the fundraising organization, centralizing all information pertaining to the entire fundraising process in one location and facilitating easy report generation. Implementing this measure will enhance the level of transparency and foster trust among the donors [5].

In 2020, Ashutosh Ashish Khanolkar, Ashish Rajendra Gokhale, Ambrish, and Vinayak A. Bharadi proposed the concept of "Blockchain-based Trusted Charity Fundraising." This decentralized application aims to fully utilize the capabilities

Investigating Technology Adoption and Consumer Behaviour in Digital Age

Ritesh Kumar Singhal[1,*], Ankit Garg[1], Pragya Agarwal[2] and **Gautam Jaiswal[3]**

[1] *Ajay Kumar Garg Institute of Management, Ghaziabad, Uttar Pradesh 201206, India*

[2] *Hi-Tech Institute of Engineering & Technology, Ghaziabad, Uttar Pradesh 201206, India*

[3] *School of Business Management, NOIDA International University, Gr Noida, Uttar Pradesh, India*

Abstract: The rapid advancements of equipment and technology, economic globalization, and other external factors are causing a shift in consumer behavior. Researchers have employed theories from various allied disciplines, such as psychology, sociology, economics, behavioral economics, and anthropology, to examine and understand consumer behavior.

The advent of information and telecommunications technology has greatly enhanced the efficiency and timeliness of communication, facilitating the seamless exchange of information within and outside organizations. Nevertheless, the use of these technologies presents challenges for both businesses and society, potentially detrimentally impacting consumer behavior.

Research on consumer behavior in electronic environments indicates that information technologies generate distinct and dynamic patterns of behavior, which differ from the typical interactions and transactions observed in traditional marketplaces. The study identified idiosyncrasies in behavior that were caused by information and communications technologies.

Keywords: Anthropology, Consumer behavior, Equipment, Economic globalization, Sociology, Technology.

INTRODUCTION

In the future, civilizations will prioritize the accumulation and advancement of knowledge, transforming it into innovative and practical solutions, thereby recognizing knowledge as a vital resource. Knowledge workers are highly esteemed as important contributors to the labor force in contemporary culture that

* **Corresponding Ritesh Kumar Singhal:** Ajay Kumar Garg Institute of Management, Ghaziabad, Uttar Pradesh, India; E-mail: spsingh.mohali@gmail.com

relies on knowledge and information. The Information Society is the main benchmark for information-based societies in the American and European Union, and it sets the essential approach for achieving this knowledge society. The objective is to augment Internet accessibility while concurrently generating knowledge that enriches the scientific and cultural legacy of emerging economies. Consumer behavior is a complex and ever-changing process that encompasses individuals' emotions, cognitions, and actions, as well as broader societal influences. Multiple factors, such as personality, lifestyle, psychographics, and motivation, influence it. The adoption of information technology has caused a shift in consumer behavior both in India and globally. While the initial acceptance of these technologies may be slow, once customers start utilizing them, they often continue to do so indefinitely. India had a total of 560 million internet users in 2018, making it the second-largest market for digital consumers and experiencing rapid growth, second only to China. Mobile data in India: On average, users consume 8.3 gigabits (GB) of data each month. In comparison, mobile users in China consume 5.5 GB of data, while in South Korea, a country with a highly advanced digital economy, the consumption ranges between 8.0 and 8.5 GB. In 2018, the number of app downloads in India exceeded 12 billion, while the country had a total of 1.2 billion active mobile phone subscribers. India is leading the way in digitalization among 17 major and developing economies, with the exception of Indonesia. Moreover, there is ample room for further growth, as only a little over 40% of the population currently has internet access. Consequently, businesses are unable to apply the same criteria to online transactions as they do to traditional ones.

Objective

The study aims to examine atypical conduct resulting from the utilization of information and telecommunication technology by analyzing consumer behavior in a digital setting.

Research Methodology

The researcher employs established quantitative and qualitative research methodologies, including categorization, analysis, statistical techniques, and so on.

Theoretical and Methodological Foundation

The foundation of this research is built upon statistical data obtained from legal institutions, information collected by the author during the survey, and publications from the media and professional literature.

Theoretical Framework

Computers and electronic communication networks have become essential instruments in the computer age and information society due to the increasing significance of information handling and processing. They provide the fastest data transfer and storage, as well as being more precise and cost-efficient compared to human labor. The ability of an organization to exchange information efficiently and generate profit is essential for its success in this scenario.

A multitude of global experts and researchers have conducted studies on two pivotal dimensions: organizations and individuals—in order to comprehend the mechanisms and motivations behind the adoption of new technologies. The Technology Acceptance Model, Motivation Model, Theory of Planned Behaviour, and Innovation Diffusion Theory are notable models commonly used for this objective [1, 2].

The Davis Technology Acceptance Model, developed by Davis in 1989, forecasts the acceptance and utilization of information technology. According to this paradigm, the perceived utility and usability of a technology influence a user's willingness to employ it. Originally designed to investigate the reception of technology in professional environments, this model has recently expanded its scope to analyze the reception of consumer services such as e-commerce and internet services.

The Technology Acceptance Model provides a dependable framework for identifying obstacles that may impede users' acceptance of technological solutions. In addition, Davis and Venkatesh have shown how the model may be enhanced beyond its original application of assessing consumer acceptance of existing products to evaluating future product concepts, such as prototypes [3]. It implies that, in alignment with the human-centered design approach, the Technology Acceptance Model could be employed to assess the effectiveness of proposed solutions in technology development initiatives (Fig. **1**).

In today's world, computers and electronic communication networks are indispensable for the management and processing of information due to their precision, cost-effectiveness, and ability to facilitate rapid storage and exchange of information. In the digital age, the smooth transmission of information is vital for the prosperity of businesses. Due to the adoption of new technology by both organizations and individuals, much research is conducted to understand the methods and motivations behind this phenomenon [4].

Comprehensive Life Cycle Methodology for the Development of Product Metrics

Swasti Singhal[1,*], Laxmi Ahuja[1] and **Himanshu Monga[2]**

[1] AIIT Amity University Noida, Noida, Uttar Pradesh 201313, India

[2] ECE Department JLN Government Engineering College Sundar Nagar, Mandi, India

Abstract: This study proposes an approach that encompasses the entire product life cycle, aimed at offering comprehensive product metrics for sustainable manufacturing. The metrics are designed to consider the three dimensions of sustainability, namely environmental, economic, and social factors. This paper centers on life cycle assessment and categorizes it into five stages of a product's life cycle, namely: the product's inception and design phase, the manufacturing phase, the transportation phase, the user experience phase, and the post-use and end-of-life cycle phases. This study centers on the metrics of the product and the challenges associated with creating a sustainable product, in addition to examining its life cycle. These provide an opportunity to establish a system of stratification for the metrics, based on the presence of distinct metrics throughout various stages of the life cycle. The generic metrics that were developed have been categorized into distinct metric clusters, which presents an opportunity to establish a metric levelling framework.

Keywords: Product life cycle, Product metrics, Sustainable manufacturing, Sustainable products.

INTRODUCTION

Sustainable products are products that are designed, manufactured, and distributed in a way that minimizes their environmental impact and ensures social and economic responsibility. These products are typically made with eco-friendly materials, are energy-efficient, and have a minimal carbon footprint throughout their lifecycle; for example, clothing made from sustainable materials such as organic cotton, bamboo, or recycled polyester. Solar panels, wind turbines, and other renewable energy systems that reduce reliance on non-renewable energy sources come under renewable energy systems. Sustainable products are becoming increasingly popular as consumers become more aware of the environ-

---
*[*] **Corresponding author Swasti Singhal:** AIIT Amity University Noida, Noida, Uttar Pradesh 201313, India; E-mail: swasti.singhal@gmail.com

mental and social impact of the products they buy [1, 2]. By choosing sustainable products, consumers can help reduce their environmental footprint, support ethical and responsible manufacturing practices, and create a more sustainable future for all [3].

Sustainable manufacturing refers to the production of goods in a way that minimizes the environmental impact [4-6], reduces resource consumption, and ensures the well-being of workers and surrounding communities. It involves incorporating sustainable practices and technologies throughout the entire manufacturing process, from raw material sourcing to product design, manufacturing, packaging, distribution, and disposal. Some of the sustainable manufacturing practices include energy-efficient manufacturing processes that use renewable energy sources and optimizing production processes to minimize energy consumption and carbon emissions [8, 9]. Also, ensuring that raw materials are sourced from sustainable and ethical sources that prioritize environmental and social responsibility [10].

The development of product-based sustainable metrics [11, 12] involves identifying and measuring the environmental and social impacts of a product throughout its entire lifecycle, from raw material extraction to end-of-life disposal. These metrics can help companies evaluate the sustainability of their products, identify areas for improvement, and track progress over time. Some common product-based sustainable metrics include carbon footprint, the total amount of greenhouse gases (GHGs) emitted during the production, transportation, use, and disposal of a product. Water footprint is the amount of water used during the production and use of a product, including both direct and indirect water use. Materials footprint is the number of natural resources used to manufacture a product, including raw materials, energy, and water. Waste footprint is the amount of waste generated during the production, use, and disposal of a product, including both solid waste and hazardous waste. Social impact is the impact of a product on workers, communities, and society as a whole, including labor practices, human rights, and community engagement.

To develop product-based sustainable metrics, companies need to collect data on their products' lifecycle and analyze it to identify areas of improvement. They can then use this information to set sustainability goals, implement sustainable practices, and track progress over time. The development of sustainable product metrics requires collaboration across all stages of the product lifecycle, including designers, manufacturers, suppliers, and customers, to ensure that sustainability is integrated into every aspect of the product's development and use. The triple bottom line (TBL) is a framework for sustainability that takes into account three key dimensions of a company's performance: economic, social, and

environmental. It is often referred to as "people, planet, and profit." The economic dimension refers to the financial performance of a company and its impact on the economy, including factors such as revenue, profits, and return on investment. The social dimension refers to a company's impact on society, including factors such as labour practices, employee relations, community involvement, and customer satisfaction. The environmental dimension refers to a company's impact on the natural environment, including factors such as resource use, waste generation, pollution, and greenhouse gas emissions.

The TBL framework recognizes that a company's success depends not only on its financial performance, but also on its ability to create value for society and minimize its impact on the environment. By considering all three dimensions of sustainability, companies can take a more holistic approach to business and ensure that they are creating value for all stakeholders, not just shareholders. The TBL has become an important tool for companies, investors, and policymakers seeking to promote sustainable development and responsible business practices. It provides a comprehensive framework for evaluating the sustainability of companies and identifying areas for improvement, and it can help companies enhance their reputation, reduce risk, and create long-term value for all stakeholders. Defining and containing the system boundaries while attempting to define the interrelationships between metrics across the triple bottom line is difficult. A complete life-cycle-based approach aids in overcoming this obstacle by developing metrics within the five life-cycle stages of a product [13 - 15].

LIFE CYCLE ASSESSMENT

LCA stands for Life Cycle Assessment, which is a methodology used to evaluate the environmental impact of a product, process or service throughout its entire life cycle, from the extraction of raw materials to the disposal or recycling of the product. LCA is a comprehensive approach that considers all the stages of a product's life cycle, including raw material extraction, transportation, manufacturing, distribution, use, and end-of-life disposal. The goal of LCA is to quantify the environmental impact of a product and identify areas for improvement in order to reduce the product's overall environmental footprint. It is highly important to consider the entire the entire product life cycle when assessing the environmental impacts of food products and the potential for reducing these impacts through sustainable production and packaging practices. It can be used to inform decision-making by companies and policymakers seeking to promote sustainable food production and reduce the environmental impact of food products. In this paper, the authors propose several optimization strategies to reduce the environmental impact of polycarbonate production, including the use of renewable energy sources, the optimization of production processes, and the

Detailed Overview of the Internet of Things and Its Amalgamation with Artificial Intelligence

Shiva Tyagi[1,*] and **Riti Rathore**[1]

[1] *Department of Computer Science and Engineering, Ajay Kumar Garg Engineering College, Ghaziabad-201009, India*

Abstract: Recommender systems can guide users towards engaging content from a diverse array of options. They serve fundamental functions in information retrieval and e-commerce by providing suggestions that narrow down extensive information spaces and guide consumers toward the goods that most effectively meet their needs and preferences. Recommender systems are computer programs that assist us in narrowing down our choices and providing optimal recommendations depending on our preferences. The recommendation algorithm autonomously filters options based on the user's preferences, making it effortless for users to locate appropriate rental properties. This research uses the cosine similarity measure to analyze its effectiveness and potential enhancements for our rental property dataset.

Keywords: Amalgamation, Algorithm, Domain, Integration, Recommender systems.

INTRODUCTION

In the contemporary period, the internet has become an integral aspect of every individual's existence. It has emerged as one of the most influential instruments worldwide. Due to significant technological advancements, the Internet now serves various purposes, one of which is the Internet of Things [1]. It facilitates the operation of different gadgets, allowing them to carry out tasks and minimize human exertion. The Internet of Things (Iota) encompasses various characteristics, including artificial intelligence, connectivity, and compact gadgets [2].

Iota employs technologies like edge computing, cloud computing, and machine learning, which utilize algorithms to enable real-time decision-making in smart

---

* **Corresponding author Shiva Tyagi:** Department of Computer Science and Engineering, Ajay Kumar Garg Engineering College, Ghaziabad-201009, India; E-mail: tyagishiva1@gmail.com

devices [3, 4]. The Internet of Things (Iota) enhances individuals' lives and productivity by enabling them to operate more intelligently and efficiently with minimal exertion. It offers insight into the operational mechanics of the business field [5]. The Internet of Things (Iota) offers advantages in various sectors. In agriculture, it utilizes analytical tools to monitor, survey, and map fields. In smart cities, Iota devices connected to sensors collect data about the city [6]. In the health sector, sensors are used to track equipment like oxygen pumps and other medical appliances. In the Industrial Internet of Things (Eliot), intelligent sensors are deployed throughout the manufacturing process to detect product production [7]. In smart homes, Iota technology is employed for various purposes. The Internet of Things (Iota) is highly beneficial for the automation of households, particularly in the context of contemporary society where nuclear families are prevalent. The adoption of home automation has experienced significant growth, facilitated by the utilization of Internet of Things (Iota) sensors [8]. This technology enables the implementation of many automated features such as digital door locks, automatic fans, LED lighting, smart switches, televisions, gardens, and kitchens (Fig. **1**).
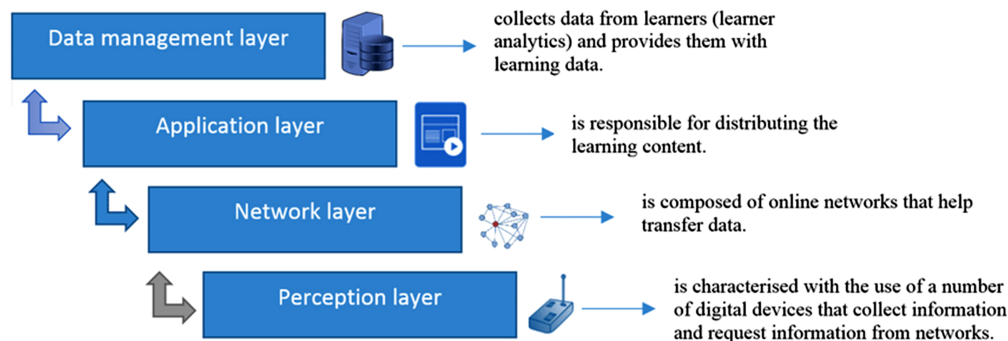
Fig. (1). IoT layers.

Sensors

It is a device utilized for the conversion of physical signals into electrical signals. Sensors are extensively utilized in Iota devices, as they are embedded within the devices to enable their functionality. There are a variety of sensors available, including temperature, light, and industrial sensors [9]. Sensors are utilized in smart homes for several purposes, like:

- Light sensors are capable of automatically deactivating the lights in the event that they are left on inadvertently. Alternatively, they can be operated manually through the use of remote controls. Additionally, it is advantageous as it conserves a significant amount of energy.

- Windows and doors - Sensors create a warning if a door or window is left open, providing valuable assistance.
- Video doorbells provide a means of detecting and visually identifying those who approach our doors, safeguarding us against potential fraudulent activities. By utilizing these sensors, we can refrain from granting access to unfamiliar individuals.

IoT for Smart Homes

A smart home is a living environment equipped with technology that enables remote control of household devices, such as appliances, through the internet. Home automation exemplifies the Internet of Things (Iota) exceptionally well [10]. In a smart house, all electronic devices can be remotely controlled *via* the internet. It allows the user to control electronic gadgets that are equipped with sensors remotely [11]. For instance, by utilizing Apple's Home Kit, consumers may effectively control and manage their household equipment through an application. However, their operation must fulfill a universal security need. There are an excessive number of issues observed in the Smart Home system. The intruder can easily compromise the security of digital locks and other related systems. Another potential issue is connectivity [12 - 14]. The sensors exhibit intermittent responsiveness. Fig. (**2**) shows the smart home technologies.
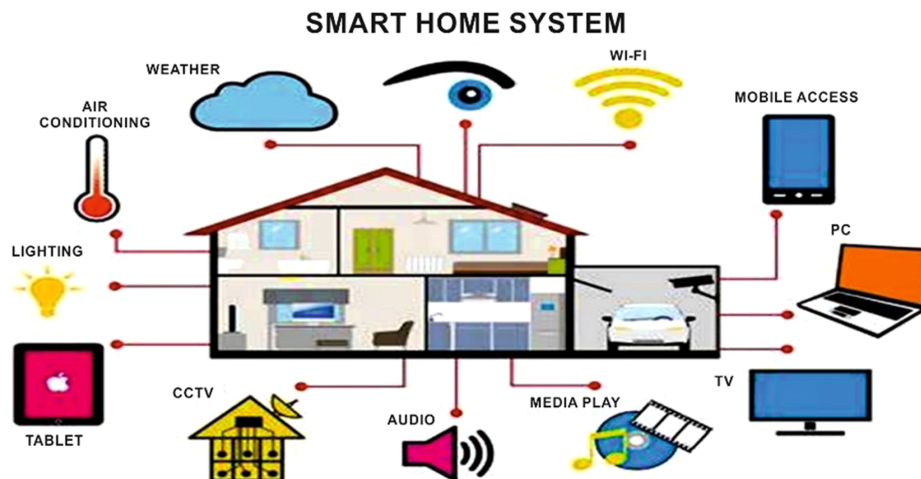
Fig. (2). Smart Home Technologies.

Benefits of IoT in Home Automation

Iota enhances home processing by gathering and analysing data to provide valuable insights and control over various aspects. Controlling the operations of

A Dual Transfer Learning Based Model for Mammogram Images Enhancement and Classification

Vandana Saini[1,*], Meenu Khurana[2] and **Rama Krishna Challa[2]**

[1] *Chitkara University Institute of Engineering and Technology Chitkara University, Himachal Pradesh, India*

[2] *Chitkara University Institute of Engineering and Technology, Chitkara University Punjab, India*

Abstract: Accurate and timely detection of breast cancer is very important to save a patient's life. Therefore, designing an accurate computer-aided diagnosis (CAD) for mammogram cancer detection is quite important for providing an interpretation to radiologists. In this paper, a CAD-based model has been proposed based on double transfer learning. The CAD system is trained to detect various abnormalities or cancers from the input mammogram images. In this study, the MIAS mammogram dataset is used to evaluate the proposed work. The original images in the dataset are also enhanced in this paper using a pre-trained VGG-16 network. The pre-processing of images has shown a better peak signal-to-noise (PSNR) value. The proposed network has shown a promising PSNR of more than 70 and classification accuracy of more than 99% with lesser system training complexity.

Keywords: Cancer, CAD, Mammogram, Transfer-learning, VGG-16.

INTRODUCTION

Breast cancer is one of the major diseases that affect around 5% of the women population in the world. Breast cancer is divided into three categories micro-calcification, masses calcification, and normal. The calcium deposits around the breast region may cause breast cancer. So, the accurate and timely detection of the cancer from the beginning stage is very crucial as a patient's life is associated with the outcome. The radiologists sometimes may fail to diagnose the beginning stage, so they use a computer-based diagnosis that assists a radiologist before the final report. The rapid development in the field of machine learning and deep learning also helps revolutionize medical CAD systems. Breast cancer is one of

---
* **Corresponding author Vandana Saini:** Chitkara University Institute of Engineering and Technology Chitkara University, Himachal Pradesh, India; E-mail: vandana.s@chitkara.edu.in

the most common and progressive diseases majorly found in women after the age of 50. During the early stages of cancer, sometimes even a doctor cannot diagnose the calcifications as cancerous or non-cancerous. So, an automatic CAD system is used to assist a doctor for a better diagnosis. Nowadays most CAD systems are based on deep neural network learning due to higher accuracy. Transfer learning is one of the most used methods to classify mammogram images after network training as they are pre-trained networks. Also, these networks are easy to train rather than developing a model and train it from starch. In this work, a multistage model is proposed for mammogram image classification into micro or mass calcification. The rapid development in the field of deep learning also helps to revolutionize medical CAD systems [1].

LITERATURE REVIEW

Contrast enhancement helps in enhancing the mammogram images for better cancer detection [2]. The author proposed an enhancement method based on CLAHE and LCM for mammogram image contrast improvement. The used method is quite adaptive in terms of pixel distribution and replacement during the preprocessing stages. The work done showed a significant improvement in the mammogram images in terms of PSNR (Peak Signal to Noise Ration).

Automated breast ultrasound can be an adjacent technique for mammography to detect breast cancer during early stages [3]. The author compared three major clinical techniques used for breast cancer detection. Tomo-synthesis and ABU can provide a close accuracy for cancer detection in contrast with existing mammogram-based methods. The study was performed to evaluate the accuracy and consistency of 3-D imagining for breast cancer detection.

The advancement in the field of machine learning helps in improving the computer-aided diagnosis system (CAD) accuracy [4]. In this work, a review of various existing methods and the latest tools was provided by the author to help other authors make CAD systems more advanced and robust. There are many available methods to improve the accuracy of mammogram images using machine learning, but now many machine learning techniques are outdated, and researchers are relying more on deep neural networks.

Breast cancer detection during early stages is very important as every year worldwide many women die due to breast cancer [5]. In this paper, the author proposed a novel method for mammogram image enhancement, so that it can help a radiologist or doctor to detect breast cancer during early stages. The implemented system can classify the images into further mass and micro calcifications.

Breast calcification is one of the common problems among women after the age of 50. Calcifications are deposition of calcium at some places in the breast, which are further classified as micro and masses calcification [6]. These calcification deposits may cause cancer, so it becomes very important to detect them in the early stages and cure it as per the doctor's advice. Micro calcification signifies small, tiny dots like calcium deposits whereas, in masses, classification is for big visible calcium deposits.

A convolutional neural network can improve breast cancer detection as it helps in accurately classifying the images as micro or mass calcification. In his work, the author used the concept of transfer learning. A pre-trained RESNET-16 network is used, which is pre-trained for a specific task. It is better to use transfer learning and a pre-trained learning network instead of training a complete network from starch [7, 8]. These networks are also easy to train and can classify the images accurately with fewer computations and training time.

PROPOSED MODEL

Image Acquisition and Pre-processing

In this step, a benchmark dataset will be acquired as input for the proposed CAD-based system. In this paper, the MIAS dataset is used. Most of the datasets including all the images were exposed to various types of images like impulse, Gaussian, *etc*. This noise may degrade the performance of classification, so a VGG-16 network is used in this work to denoise the dataset. The VGG-16 network is transformed into an adaptive denoising network by defining its fully connected as depicted in Fig. (**1**). The adaptive behavior helps the network to learn at a dynamic rate *i.e.*, the value of the learning factor (**α)** keeps on changing. This helps in improving the network learning rate and will return better PSNR.
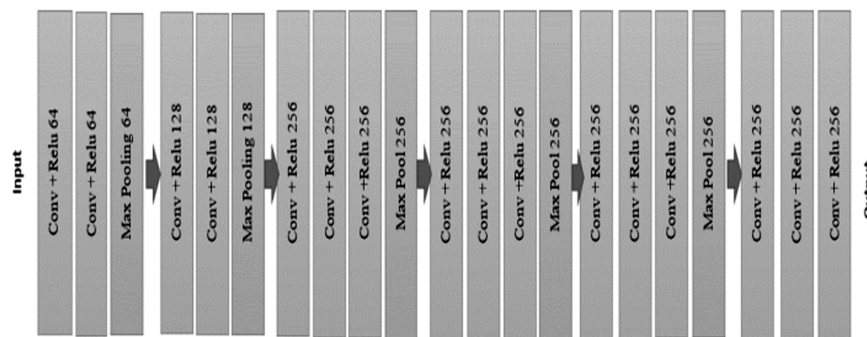
Fig. (1). VGG-16 Network Architecture.

Empirical Analysis of Face Mask Detection Using Deep Learning

Arunima Jaiswal[1,*], Khushboo Kem[1], Aruna Ippili[1], Lydia Nenghoithem Haokip[1] and Nitin Sachdeva[2]

[1] *Department of Computer Science & Engineering, Indira Gandhi Delhi Technical University For Women, India*

[2] *IT Department , Galgotias College of Engineering , Greater Noida , India*

Abstract: Covid-19 has been highly destructive to human health across the globe. Ever since it was discovered in 2019, the pandemic has continued to take the lives of millions. Global efforts like wearing a face mask in public areas have led to the decline of infection, which has given rise to many face mask detection models to ensure that individuals are wearing their masks properly. In this paper, we aim to compare five deep learning models for face mask detection on two different datasets namely the face mask detection dataset (DS1) and the face mask 12k images dataset (DS2). The different models that we have implemented are YOLOV3, YOLOV5, ResNet 50, MobileNet V2, and VGG-16 . The results are evaluated on the grounds of precision, recall, mean average precision (mAP), and accuracy.

Keywords: Deep learning models, Empirical analysis, Face Mask Detection, Object detection techniques, Pandemic.

INTRODUCTION

The ongoing COVID-19 pandemic has severely hit the world with the novel coronavirus also known as COVID-19 [1], which is caused by severe acute respiratory syndrome coronavirus2 (SARS-CoV-2) [2]. The unprecedented rise of the coronavirus killed around 6 million people worldwide and governments have since focused on preventing and curing the disease. As the virus is highly communicable, it can be transferred to anyone who comes in close contact with a patient who at the time of exposure may or may not show the signs and symptoms of the disease. Governments have made it mandatory for masks to be worn [3] in public spaces, which gives rise to the need to monitor individuals to ensure that they are wearing their masks properly. To make this tedious job easier, many deep

---

[*] **Corresponding author Arunima Jaiswal:** Department of Computer Science & Engineering, Indira Gandhi Delhi Technical University For Women, India; E-mail: arunimajaiswal@igdtuw.ac.in

networking models [4] are used to incorporate safe monitoring like face mask detection [5] and social distance [6].

To ensure safety measures in public, various combined and unified objects are being used like social distance trackers and face mask detectors [6]. The main concept following these is to discover the bounding boxes belonging to the class of the training dataset. Face mask detection [7] is an important area of pattern recognition, which is carried out through deep learning models [8], which is a highly sophisticated subset of machine learning based on artificial neural networks that facilitate a computer to understand and act like the human brain [9]. The models can detect target objects like masks on the human face [10] and when they are integrated with existing technology they give rise to surveillance technology [11], which allows accurate monitoring. These automated finding and management systems are a simple, efficient, and cost-effective method for controlling COVID-19 transmission in public spaces.

This paper mainly compares the five models namely, YOLOV3 [12],YOLO V5 [13], ResNet50 [14], using TensorFlow, MobileNet V2 [15], and VGG-16 [3] for face mask detection based on two datasets namely face mask detection dataset (DS1) and face mask 12k images dataset (DS2). The datasets have been divided into training, testing, and validation datasets. The performance parameters taken into account in this paper are accuracy [16], precision, recall [17], and mean average precision [18]. The paper has been divided as follows. Section 2 provides a brief background on the key concepts of the work. Section 3 explains the system architecture. Section 4 refers to the result of the analysis and section 5 confers the conclusion and future scope of this work.

RELATED WORK

Object Detection proves to be one of the best and impactful studies in terms of computer vision, which is a great boon in such life-threatening times of COVID-19. Deep networking models have given promising results in many fields with good values of accuracy, which increases human trust in these Artificial Intelligence technologies. Researchers [3, 4, 8, 15] have used different datasets for drawing the comparisons by working on different techniques like YOLOv3 [6], YOLOv5 [5], and MobileNetV2 [15] and measured the results through parameters like precision, recall, accuracy, and F1 score. While studying the background of object detection history, we came across that some research papers involved working on the FMD dataset using YOLOv5 [11] whereas some approached the details by creating their dataset with the collection of images using CNN [19] as the main architecture and MobileNet as the backbone [20].

This section digs into the history of work done on face mask detection especially using the ones that used deep learning models. Object detection algorithms come into play for detecting multiple objects in images or videos as per the data given in the datasets [21]. Deep neural models are used in a study [13, 16] to detect whether the person is wearing a face mask or not.

Table **1** below explains the details of research papers that have been analysed to draw a conclusion on which of the techniques and parameters should be considered to achieve maximum accuracy results.

Table 1. Research papers analysis

S. No	Author	Techniques	Dataset	Performance Parameters	Result
1	Ullah *et al.* [1] 2022	DeepMaskNet model and compare with 9 different models.	MDMFR	Accuracy, Precision, Recall, F1 Score.	Accuracy = 100%
2	Kumar *et al.* [2] 2022	ETL-YOLOv4, Tiny YOLOv4.	Face mask detection dataset.	Precision, Recall, Average Precision, mean average precision (mAP).	mAP (ETL-YOLOv4) = 67.64%, mAP (Tiny YOLOv4) = 57.71%.
3	Saravanan *et al.* [3] 2022	Pretrained CNN *i.e* - Vgg16.	Two face mask datasets with different concentrations.	Accuracy	face mask dataset 1 = 96.50%, face mask dataset 2 = 91%.
4	Kaur *et al.* [5] 2022	CNN.	Face dataset (with/without mask).	-	-
5	Ottakath *et al.* [4] 2022	Mask RCNN, YOLOv4, YOLOv5 , YOLOR.	MOXA3K, ViDMASK dataset.	Precision, Recall, Average Precision, mean average precision (mAP).	Precision, Recall, Average Precision, mean average precision (mAP).
6	Prasad *et al.* [6] 2022	CNN. YOLOv3, LBPH.	COCO	Accuracy	Acc = 95.77%

Estimation of the Price of Used Cars Using Machine Learning

Ramander Singh[1,*]

[1] *Department of Computer Science and Engineering, IMS Engineering College, Ghaziabad, (U.P.), India*

Abstract: The manufacturer sets the price of new vehicles in the market, and taxes are an additional expense imposed by the government. Consumers can confidently purchase a new car, expecting a favourable return on their investment. However, with the rising cost of new automobiles, there is a growing trend worldwide for people to opt for purchasing pre-owned vehicles. As a result, there is an increasing need for a proficient and comprehensive system that can accurately predict the prices of pre-owned vehicles based on several features. This article demonstrates the predictive capability for older cars by using linear lasso regression, a machine-learning technique. This approach ensures a prediction accuracy of 83%, making it the most precise among three distinct algorithms. The data includes information on the model year, car model, engine type, and price. Over the past decade, one of the most significant advancements in technology has been machine learning, which has had a crucial impact on precise forecasting and reliability.

Keywords: Automobiles, Advancements, Crucial, Forecasting, Precision, Worldwide.

INTRODUCTION

According to the data, predicting car behaviour is a significant and intriguing issue. Forecasts on the pricing of vintage automobiles will prove beneficial to the majority of individuals. Anticipating the costs of vehicles is an essential and noteworthy method, especially for older, non-new vehicles [1]. An increasing number of car buyers are seeking alternatives to buying new automobiles directly, as there has been a surge in demand for used cars and a decrease of up to nine percent in demand for new cars in 2014 [2]. Leasing is a more prevalent option compared to purchasing an automobile, as it entails a legally binding agreement between the customer and seller. The seller group encompasses direct sellers, third-party entities, enterprises, and insurance providers [3]. Through a lease

---

[*] **Corresponding author Ramander Singh:** Department of Computer Science and Engineering, IMS Engineering College, Ghaziabad, (U.P.), India; E-mail: ramendera@gmail.com

arrangement, the buyers make periodic payments for the item over a predetermined duration. Vendors are interested in understanding the lease payments as the anticipated expense of the car determines them. Precise automotive price prediction requires specialized expertise, as the price of a car typically relies on a variety of unique characteristics and factors [4]. The primary factors of importance are often the brand, age, mileage, horsepower, and model [5]. The price of a car is significantly affected by the type of petrol used and the amount of fuel consumed each mile due to the regular changes in petroleum prices [6]. The price of an automobile is influenced by factors such as the number of doors, exterior colour, gearbox type, presence of air conditioning, size, GPS capability, safety features, and interior design [7]. This study focused on exploring a range of methods and approaches to enhance the precision of predicting the prices of pre-owned vehicles. In addition to ensuring the accuracy of information, Machine Learning approaches primarily aim to enhance the predictive capabilities of software programs without the need for explicit programming [8]. Machine learning primarily utilizes pre-existing data to forecast output values. "Machine Learning (ML) has proven its utility by offering solutions to problems at a velocity and magnitude surpassing the capabilities of the human intellect." Machines can be trained to identify patterns and correlations in incoming data by linking the significant processing power of a single activity or multiple distinct tasks [9]. It enables machines to perform mundane activities autonomously. This study aims to assess the extent to which machine learning enhances prediction outcomes in terms of accuracy and data diversity. Fig. (**1**) illustrates the process flowchart:
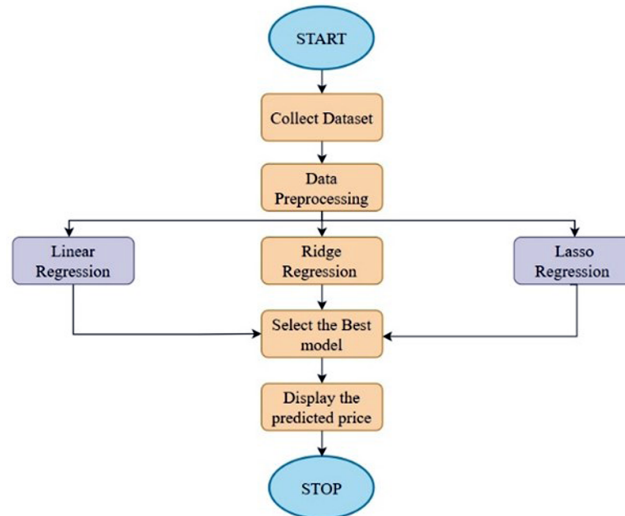
Fig. (1). Flow Chart.

In this research, linear and lasso regression are utilized to enhance the accuracy of the prediction. These algorithms outperform other machine learning algorithms in terms of accuracy [10]. After the user has acquired a prediction rate for the car, they can subsequently execute numerous other functions with high accuracy. In the proposed System, depicted in Fig. (**1**), we have endeavored to tackle the issues present in the current System. We have developed a graphical user interface (GUI). In order to improve the precision and reliability of our output forecasts, we have included three separate machine learning algorithms - lasso regression, linear regression, and ridge regression - in our company.

Lasso Regression

Lasso regression is primarily built around the principle of regularization. Regression techniques are utilized to improve the precision of forecasts. This approach integrates the concept of reduction [11]. The term "LASSO" is an abbreviation for "Least Absolute Shrinkage and Selection Operator." To achieve improved balance, we use lasso regression. Regression methods are preferred when the goal is to obtain a more accurate estimate.This concept is more efficient when it is scaled down [12]. Shrinkage is the term used to describe the phenomena when the values in a dataset approach the average. The lasso method facilitates the creation of concise models with little intricacy. This form of regression is advantageous in situations when there is a notable presence of multicollinearity in a model or when there is a need to streamline the model selection process by automating tasks such as variable selection and parameter removal [13]. In this scenario, the price of the car is regarded as the dependent variable, while all other factors are regarded as independent variables. Used cars have extensive input dimensions [14]. The multitude of characteristics and factors that influence the pricing of an automobile results in a significant amount of data that is inherently difficult to analyze. The objective of the research is to develop a model that can efficiently handle high degrees of complexity and produce precise outcomes, irrespective of the extent of data collection [15].

Software Requirement Properties

Python 3.6.0, an agile and object-oriented programming language, is well-suited for many software development projects. It may be obtained quickly within a few days, has substantial existing libraries, and offers strong support for integrating various languages and technologies [16]. A significant number of Python programmers assert that their efficiency has greatly increased and that the language facilitates the development of superior, more organized code. The Jupyter Notebook: The Jupyter Notebook App is a software that operates as a server-client system, capable of being installed on a computer and accessed using

Crop Recommendation System

Samyak Jain[1,*], Ashutosh Saxena[1], Aditya Garg[1] and **Manu Singh[1]**

[1] *Department of Computer Science and Engineering, ABES Engineering College, Ghaziabad, India*

Abstract: Agriculture serves as a prominent source of employment for Indian farmers. A prevalent issue among Indian farmers is their inability to make informed decisions regarding crop selection based on soil type. It has a profound impact on productivity. Precision agriculture provides a solution to this issue. This strategy is characterized by the utilization of a soil database that is based on farms, the provision of crops by agricultural experts, and the satisfaction of specific requirements, such as soil quality, through the use of a dataset obtained from a soil testing laboratory. The soil-testing lab offers data derived from the system of recommendations. Subsequently, it will be employed to collect data and construct a band model by employing a technique of determining the outcome according to the preference of the majority. The researchers utilize an Artificial Neural Network (ANN) in conjunction with a Support Vector Machine (SVM) to provide precise recommendations for crop selection based on site-specific conditions and efficacy.

Keywords: ANN, Band model, Data, Majority vote process, Support vector machines.

INTRODUCTION

India is a prominent force in global agriculture. Approximately 60% of India's populace depends on agriculture as their primary source of livelihood. In FY 2021-22, the agriculture industry accounted for 18.8% of the total Gross value added. In 2019, the average monthly income per farming household in the country was INR 10,218. Based on the 2011 census, approximately 2000 farmers ceased agricultural activities on a daily basis [1, 2]. Approximately 1100 farmers in India took their own lives, representing 7% of the overall suicide rate in the country. The farmers utilize outdated and conventional techniques for farming and crop selection. The non-scientific methods of crop selection lead to the following issues: diminished profitability, reduced production, and declining soil quality [3 - 5]. Consequently, this leads to a decline in the number of farmers engaged in agri-

---

[*] **Corresponding author Samyak Jain:** Department of Computer Science and Engineering, ABES Engineering College, Ghaziabad, India; E-mail: samyakjain3305@gmail.com

culture, an increased rate of migration towards urban areas, and elevated levels of suicide. In order to address this issue and foster self-sufficiency among Indian farmers, we suggest implementing the following system: To facilitate the process of choosing crops, it is important to take into account soil parameters such as the ratio of nitrogen, potassium, and phosphorus, as well as the pH value [6, 7]. Additionally, environmental elements such as relative humidity, rainfall, and temperature should also be considered. The system is constructed utilizing machine learning techniques, enabling autonomous updates and continuous improvement. The suggested approach provides recommendations for both native and alien crops that are suitable for the specific soil and environmental conditions at a given time [8, 9].

Definition

Accurate crop production forecast is of utmost importance for federal and provincial decision-makers to facilitate prompt decision-making. Predictive models can assist farmers in determining optimal development and manufacturing timelines. There exist various methods for predicting agricultural crop yields [10].

Scope

The objective of the project is to ascertain the agricultural productivity of a location by graphically representing a dataset containing key factors such as temperature, humidity, rainfall, and crop yield. Regression models are employed for the purpose of forecasting a continuous variable [11].

RELATED WORKS

Agriculture is a primary source of income for Indians. Nevertheless, Indian ranchers diligently work in their fields, yet natural factors compromise their productivity. It is an indisputable fact that natural variables are unpredictable. Hence, the most efficient approach is to eliminate the majority of them from the equation while disregarding the organic factors. Soil degradation is a significant problem that can be prevented by cultivating the most suitable crops for the region [12]. Regardless of the rancher's choice of crop, the appropriate application of fertilizers would be beneficial. Another significant concern is insect infestation, which may be effectively addressed by using suitable pesticides. It will benefit cattle farmers. The government conducts many soil tests in India to examine the properties of the soil, but farmers need to gain knowledge on how to interpret the results of these tests [13]. Therefore, the Crop Recommendation System leverages all the benefits of the test and aids farmers with crop recommendations.

LITERATURE REVIEW

Agriculture is a major source of employment in India, and Indian farmers dedicate their utmost effort to provide sustenance to the population. Ranchers primarily oversee the cultivation and fertilization of crops. The Harvest proposal framework aims to support Indian farmers by utilizing the yield components. The topic of crop recommendation has been extensively researched. However, the various systems vary based on the parameters handled in the machine learning model. Many ML models employ random forests. Some use decision trees, while others utilize ensemble methods such as majority voting [14]. The primary explanation can be attributed to fragmented information. However, the Harvest proposal framework aggregated data from several sources and organized it to create a well-structured dataset. A word reference-based arrangement is implemented in the Harvest recommendation system. The yield proposal framework incorporates ISO 9001 and ISO 14001 standards [15]. The following is the analysis of many examination papers about the services offered by the Harvest recommendation system. The citation provided is from Rajak *et al.* on pages 951-952. The research examines crop predictions using several algorithms such as Support Vector Machines (SVM), Naive Bayes, Multi-layer Perceptron (ANN), and Random Forests. The parameters employed for crop prediction include pH, depth, water retention capacity, drainage, and erosion. The diagram below depicts the suggested recommendation framework. The pH level is slightly alkaline. The depth is greater than 90. The water holding capacity is low. The drainage is moderate [16]. If erosion is low, then it is suitable for growing paddy. (Dighe *et al.* 476-480) In other words, the study examined CHAID, KNN, Kimplies, Choice Tree, Brain Organisation, Innocent Bayes, C4.5, Fellow, IBK, and SVM algorithms and generated rules for the suggested framework. Various criteria, such as soil pH level, duration of growth, local climate, temperature, soil type, and others, were taken into consideration to determine the optimal crops for the estate. A study was conducted on area identification, information analysis, and storage, as well as comparative location detection and suggestion generation by Mokarrama and Arefin. The final Harvest was obtained using the physiographic information base, Warm zone data set, Harvest developing period data set, crop creation rate data set, and occasional yield data set [17]. The work by Gandge and Sandhya explores the topics of characteristic choice, numerous direct relapses, and choice trees using various algorithms such as ID3, SVM, brain organisations, C4.5, K-means, and K-nearest neighbors (KNN). The proposed framework consists of two main steps: firstly, the identification of a specific horticultural field, and secondly, the selection of a recently planted harvest [18]. The framework takes input from the client, pre-processes it, and then performs characteristic determination in the backend. A calculation of information characterization follows it, and finally, the framework suggests the yield. (Mishra

A Smart System for Tracking and Analyzing Human Hand Movements using MediaPipe Technology and TensorFlow

Mahesh Kumar Singh[1,*], Arun Kumar Singh[2], Pushpa Choudhary[3], Pushpendra Singh[4] and **Akhilesh Kumar Singh[5]**

[1] *Dronacharya Group of Institutions, Greater Noida-201306, Uttar Pradesh, India*

[2] *Greater Noida Institute of Technology Gr Noida-201306, Uttar Pradesh, India*

[3] *Galgotias College of Engineering and Technology, Greater Noida-201306,Uttar Pradesh, India*

[4] *SRMIST Delhi NCR Campus Modi Nagar Ghaziabad UP 201204, Uttar Pradesh, India*

[5] *School of Computing and Technology, Galgotias University, Greater Noida 201306, Uttar Pradesh, India*

Abstract: Gesture recognition is the latest and the most popular technology nowadays. The main aim of this technology is to recognize human body parts using mathematical algorithms MediaPipe and TensorFlow. The hand is a very important part of the human body for performing any activity. The detection and analysis of body language have recently gained a lot of attention. In this paper, we look at the skeleton poses of a person. It is easy to grasp and have images with low dimensionality statistics. Underfed interpretations generalize a person's appearance and background, allowing them to be identified. This paper describes a real human chasing channel capable of anticipating the structure of both hands and the location of the fingers, focusing on motion recognition, and creating virtual hand brushes that can be very beneficial and easing activities like the selection of colors and paintings in combination with paint art. This paper, which uses hand gesture detection and has a 95% confidence accuracy rate, was built using MediaPipe, a deep learning framework, in addition to assessing numerous static or dynamic hand motion detection methods.

Keywords: Artificial intelligence, Deep hand gesture recognizer, Extensible calculators, HMMs, Hand tracking, MediaPipe, Machine learning, Paintbrush.

INTRODUCTION

According to a survey by Ipsos for the World Economic Forum, nearly 60% of individuals believe that AI-powered services and products will significantly

---

* **Corresponding author Mahesh Kumar Singh:** Dronacharya Group of Institutions, Greater Noida-201306, Uttar Pradesh, India; E-mail: maheshkrsg@gmail.com

impact daily life activities [1]. Artificial intelligence (AI) stands for imitating humanoid intelligence using robots, which are skilled in acting as well as thinking as persons. This expression may also be related to an appliance that exhibits capabilities like humans or persons such as knowledge gaining as well as the ability to solve complex problems. This type of intelligence has one of the strongest features, its power to investigate appropriate actions proven by showcasing the best possibility for attaining a particular goal. Artificial education is an application of intelligent retrieval, which corresponds to the concept of processor software learning in addition to the adaptation of changing information deprived of the assistance of humans. Artificial neural networks enable self-learning by consuming enormous amounts of raw data such as literature, images, and film. Machine learning has mostly played a significant role in today's modern civilization, as technology advances and simplifies all our daily tasks. At the same time, this is becoming more prominent because of recent advancements in the disciplines of artificial intelligence and machine learning. Any aspect of human life and society that has not been influenced by AI is nearly impossible to envisage or idealize. It always influences many aspects of our lives to help us become more productive with our time.

In today's innovative world, where technology is progressing as well as simplifying all our day-to-day tasks, artificial intelligence has always been playing a very prominent role. It has always been constantly influencing every facet of our lives to help us become more time-efficient [2]. Artificial intelligence now penetrates every aspect of our online lives, both personal and professional. Global communication and connectivity in business is a topic that is becoming increasingly important. Artificial intelligence and information science must be used, and their growth potential is limitless. Artificial intelligence is becoming increasingly important in a range of industries, including [3]:

- Medical science.
- Transportation.
- Banks and Financial Institutions.
- Entertainment and Gaming.

Our dependence on cell phones and virtualized assistants such as Alexa as well as Cortana, which respond to our inquiries, is an obvious and classic example of AI affecting our daily lives. As a result, current social media sites such as Facebook, Instagram, and Twitter account for a large portion of almost everyone's lives. Furthermore, the volume of data produced by humans and machines is much more numerous than our ability to absorb, analyze, evaluate, and make complex as well

as correct decisions based just on computed data. Some recent statistics that have been recorded are given below:

- According to Statista [4], the worldwide Artificial Intelligence (AI) technology industry is expected to reach 126 billion USD by 2025.
- As per Gartner [5], 37% of companies have implemented AI in some manner. The number of organizations utilizing AI has increased by 270 percent in the previous four years.
- According to Servion Global Solutions [6], AI will power 95 percent of customer communications by 2025.
- The worldwide AI software business is expected to grow 54 percent annualized in 2020, reaching an estimated value of USD 22.6 billion, as per Statista's latest prediction [7].

AI is the foundation of all computer learning, and AI seems to be the future of all intelligent decision-making. Artificial Intelligence seems to have the power to accelerate our operations and procedures while retaining high precision and reliability, which is critical in today's environment. The capacity to be blunder-free, accurate, and fast at the same time is what distinguishes a useful and crucial tool [8].

RELATED WORK

The human hand is an essential tool for communication when people interact with one another and their environment in daily life. The identification of hand gestures and human actions is directly related to the postures and orientations of human hands. Because of this, accurately identifying human hands from single-color images or videos taken with conventional image sensors is essential in several computer vision applications [9, 10], such as human-computer interface, estimation of human hand posture, gesture recognition, activity analysis, and so forth. Hand tracking [11] is the method by which a computer detects a hand from an input image using computer vision and maintains focus on the hand's movement and position. Hand tracking allows you to create a variety of applications that use hand movement and orientation as input. Many computer vision tasks related to the human hand, such as hand pose estimation [12], hand gesture identification [13], and human activity analysis [14], have previously been a processing approach .

Gesture recognition is a popular issue in the field of Human-Computer Interaction [15, 16]. There are several data scientists and academicians, who have successfully used hand-gesture detection and identification including blind interpreters, wearable technology, and hand-controlled robotics [17] in recent

Initiatives for Challenges Faced By Developed Countries and India on Green Growth and Sustainable Development in the World

Shalin Kumar[1,*], Parul Verma[2], Hoshiyar Singh Kanyal[3], Praveen Chandra Jha[4] and **Jyoti Rai[5]**

[1] *Department of Applied Science, Greater Noida Institute of Technology, Greater Noida, (U.P), India*

[2] *Depatment of Applied Science and Humanities, Ajay Kumar Garg. Engineering College, Ghaziabad, (U.P.), India*

[3] *Depatment of Computer Science & Engg., Hi-Tech Institute of Engineering and Technology, Ghaziabad, (U.P), India*

[4] *Depatment of Applied Science and Humanities, ITS Engineering College, Greater Noida (U.P.), India*

[5] *Depatment of Applied Science and Humanities R.D. Engineering College, Ghaziabad, (U.P.), India*

Abstract: This review article analyzes various sign language recognition methodologies that rely on sign acquisition techniques and sign identification methods. Artificial neural networks are well suited for analyzing gestures, employing vision-based methods, and identifying signs. The Sign Language Recognition (SLR) system is a method for understanding a set of generated signs and converting them into text or speech while preserving the necessary context. The application of gesture recognition can exemplify effective human-machine interactions. Our objective in this study was to develop a model using a convolutional neural network. Consequently, the precision rate stands at approximately 85%. Subsequent efforts should enhance the Image Processing module to facilitate bidirectional communication, namely enabling the system to seamlessly convert between sign language and conventional language in both directions.

Keywords: Article, Acquisition, Language, Methodologies, Recognition, Techniques.

* **Corresponding author Shalin Kumar:** Department of Applied Science, Greater Noida Institute of Technology, Greater Noida, (U.P) India; E-mail: shalinkumar@rediffmail.com

INTRODUCTION

Green growth refers to the promotion and efficient utilization of natural resources in order to mitigate the environmental dangers that constitute a threat to all life forms on Earth [1]. According to the union budget for 2023-24, Green growth and sustainable development are among the seven main priorities (SAPTRISHI) for promoting the green industrial and economic transition, environmentally friendly agriculture, and sustainable energy in the country [2]. The National Action Plan on Climate Change (NAPCC), in alignment with the State Action Plan on environmental protection, is a significant achievement in integrating green growth and sustainable development [3]. The concept of green growth extends beyond climate change and adaptation, focusing on the sustainable development of the country [4]. The MOEFCC (Ministry of Environment, Forest and Climate Change) aims to identify the fundamental factors contributing to the elimination of poverty, while also promoting environmentally sustainable economic development. The Finance Commission of India and the Central Government are collaborating to reassess policies about green growth and their effects on the environment, ecosystem, and natural resources that are accessible to impoverished and vulnerable populations [5]. In addition, the Indian Government has implemented the smart city mission, which seeks to foster communities that offer a high standard of living to their residents in various aspects, including infrastructure, cleanliness, sustainability, and a pollution-free environment. Environmental performance has a positive correlation with the economic growth of countries.

RELATIVE WORKS

By examining both perspectives on this matter, the effort aims to ascertain methods through which both nations might collaborate in order to establish more environmentally friendly policies that are advantageous to all [6]. The program focuses on addressing difficulties arising from environmental, economic, and social considerations and offers customized solutions that cater to the unique needs and capacities of each country [7]. In addition, the program aims to investigate how collaborations between developed countries and India might narrow the divide between them and foster enhanced environmentally friendly economic growth and sustainable development for both nations [8]. Recently, the world has encountered an unparalleled obstacle in achieving sustainable development and promoting environmentally friendly economic growth [9]. Developed nations, specifically, have faced mounting demands to decrease carbon emissions and achieve energy efficiency goals [10]. As a result, there has been a rise in the development of advanced computational models that are designed to address and overcome this challenge effectively [11]. Two highly effective

models implemented by the EU are the Clean Energy Package and the Eco-Innovation framework. These models have played a significant role in advancing secure and environmentally friendly energy efforts in various sectors [12]. The Ministry of Environment [13], Forest and Climate Change (MoEFCC) in India is leading the country's efforts towards sustainable development and environmentally friendly growth [14]. This is being achieved through the implementation of initiatives like the National Mission on Sustainable Development (NMSD) and the National Action Plan on Climate Change (NAPCC). These programs align with multiple research endeavors that aim to promote the utilization of data-driven and evidence-based computational models to create practical solutions for issues related to the Sustainable Development Goals (SDGs) [15]. The Government of India has recently created several country-specific computational models to address challenges connected to the Sustainable Development Goals (SDGs) [16]. These models focus on issues such as ensuring access to water and sanitation, combating air pollution, addressing extreme weather occurrences, and enhancing energy access. Sustainable development and green growth have been the focal points of global infrastructure progress for an extended period. Developed nations have effectively implemented steps to promote green growth, whereas countries like India still need to establish appropriate models for this complex process fully [17]. This essay examines the hurdles encountered by industrialized countries and India in achieving green growth and sustainable development [18]. It emphasizes the crucial role of using suitable diagnostic models to solve these difficulties. Given the increasing importance of sustainability and green growth as indicators of development, it is evident that the monitoring models for these processes need to be meticulously crafted [19]. Diagnostic models are particularly crucial in the context of green growth and sustainable development since they assist in identifying the specific locations where problems arise. These models enable governments and policymakers to pinpoint the obstacles preventing countries from achieving their sustainable goals. A significant obstacle encountered by both industrialized and developing nations in their pursuit of sustainable growth is the substantial financial burden involved [20]. Although policymakers can employ sophisticated diagnostic models, the implementation of these initiatives incurs significant financial expenses. Several countries, especially those in the developing world, still need more financial resources to establish and implement such models.

CHALLENGES IN GREEN GROWTH AND SUSTAINABLE DEVELOPMENT

According to the World Bank report, India is expected to be the world's fastest-expanding economy. However, its economic growth is forecast to decrease to 6.9% in the financial year 2023 and 6.6% in the financial year 2024, down from

The Impact of Green Marketing on Consumer Purchasing Behaviour: A Study of the Attitudes, Beliefs, and Behaviours of Consumers towards Environmentally-Friendly Products

Mansi Singhal[1,*], Priyanka[1] and Vipul Kumar[1]

[1] *Department of Management Studies, Hi-Tech Institute of Engineering and Technology, Ghaziabad, (U.P.), India*

Abstract: Green Marketing is a fascinating subject that revolves around consumers, who are not only concerned about the environment but also knowledgeable about eco-friendly items. While corporations are actively investigating various strategies to enhance consumer knowledge of green management, they are unable to reach rural areas effectively. The study seeks to determine the influence of green marketing on customer purchasing behavior. How will demand be stimulated by the implementation of advanced green methods in rural regions? The research study was conducted in rural parts of Delhi NCR, where a total of 250 replies were gathered. The respondents have shown a good inclination towards the ABC model of attitude during the assessment. According to the report, companies must enhance their contact with consumers. Furthermore, it is necessary to prioritize traits such as affordability and quality over social duty.

Keywords: Green Marketing, Consumers, Eco-Friendly, Influence, Marketing, Rural Market.

INTRODUCTION

Green marketing is the utilization of marketing strategies and tactics to advertise items or services that are seen as being environmentally conscious. The influence of green marketing on consumer buying behavior has emerged as a progressively significant field of study in recent times [1]. This is due to the growing consumer awareness of environmental concerns and their heightened inclination toward buying eco-friendly items [2]. Multiple research studies have investigated the attitudes, beliefs, and behaviors of customers towards environmentally friendly

---

[*] **Corresponding author Mansi Singhal:** Department of Management Studies, Hi-Tech Institute of Engineering and Technology, Ghaziabad, (U.P.), India; E-mail: mancsinghal@gmail.com

products [Prakash, G., & Pathak, P. (2017)] [3]. The findings of these studies indicate a favorable correlation between green marketing and customer buying behavior. Consumers who are exposed to green marketing have a higher propensity to buy environmentally friendly products [4]. One explanation for this is that green marketing can enhance consumers' consciousness of environmental concerns and the influence of their purchasing behavior on the environment. Consumers with a higher level of awareness of these concerns are more inclined to actively search for eco-friendly items and make purchasing choices based on their environmental consequences [Garg, A., & Kumar, D. S. (2022)] [5]. The perceived advantages of environmentally friendly products are another influential aspect of customer purchase behavior. Consumers are more inclined to purchase things that they perceive as having superior quality, being healthier, and being safer for both themselves and the environment [Govender, J. P., & Govender, T. L. (2016)] [6]. Green marketing can highlight these advantages and enhance consumers' inclination to select eco-friendly items. Therefore, it is imperative to comprehend consumer behavior [Sreen, N., Purbey, S., & Sadarangani, P. (2018)] [7]. The ABC Attitude Model, commonly referred to as the tripartite model, was formulated by Albert Elli and comprises three fundamental elements: Affective, Behavioural, and Cognitive [8]. Affective attitude pertains to an individual's emotional reaction or sentiment (favorable/unfavorable) towards a particular entity [Bhalla, T. (2021)]. Behavioral attitude refers to our actions or responses towards something, whether they are positive or negative. Cognitive attitude refers to the process of assessing or forming opinions about something [9]. To comprehend consumer behavior, we perform our research utilizing the ABC Attitude Model. [Nekmahmud, M., & Fekete-Farkas, M. (2020)] [10]. Green marketing can generate consumer distrust. Consumers may have apprehensions regarding corporations employing green marketing strategies to boost revenues without making substantial alterations to their products or manufacturing procedures.

RELATED WORKS

This study is novel because it offers a valuable understanding of consumers' attitudes, beliefs, and behaviors about environmentally friendly items [11]. The study also evaluates the influence of green marketing on customer buying behavior. Furthermore, the study examines the influence of attitudes, beliefs, and actions on customer decision-making. Furthermore, it explores the influence of environmental factors on customer buying behavior and examines the efficacy of green marketing tactics. This analysis offers a thorough examination of the present condition of green marketing and its impact on consumer buying choices. Additionally, the research offers valuable information on how to enhance the marketing of environmentally friendly products to boost customer involvement

and consequent buying choices. Advancements in computational models have recently resulted in the creation of advanced methods for analyzing consumer buying patterns and their influence on environmentally friendly marketing strategies [12]. The utilization of artificial intelligence (AI) and machine learning (ML) algorithms, in conjunction with novel analytical methodologies, facilitates the examination of vast quantities of data in a streamlined, accurate, and economical manner [13]. This technique offers vital insights into the attitudes, beliefs, and behaviors of consumers about environmentally friendly products and services, and ML models can be employed to gain a deeper comprehension of how green marketing initiatives impact customer purchasing choices [14]. AI and ML models can be utilized to detect trends and connections between consumer preferences and green marketing activities. This information can then be used to impact public policies, marketing campaigns, and targeted marketing efforts [15]. Furthermore, the models can be utilized to gain a deeper comprehension of the essential components of a green marketing strategy, encompassing its substance, layout, and communication channels. By utilizing these valuable observations, marketers may create more refined campaigns that strongly resonate with their intended audience, hence enhancing their likelihood of achieving success [16]. Furthermore, advanced techniques such as text mining, natural language processing (NLP), sentiment analysis, and visual analytics can be employed to reveal novel insights into consumers' views and behaviors. The challenge with diagnostic models for green marketing on consumer purchasing behavior lies in the inherent difficulty of comprehensively collecting the complete spectrum of attitudes and behaviors exhibited by consumers toward environmentally friendly items [17]. Although conventional marketing techniques may encompass certain elements of green marketing, the information gathered may need to be sufficiently thorough to precisely measure and analyze the complete influence of green marketing on customer buying patterns. Furthermore, green marketing is commonly perceived as a nascent marketing strategy that is currently evolving and increasing in significance [18]. Therefore, it can be challenging to determine the most effective diagnostic models for evaluating the influence of green marketing on customer buying behaviour [19]. Therefore, researchers should not solely focus on classic models but also evaluate the diagnostic capacities of novel models. Consumer behavior is dynamic and can be significantly impacted by technological advancements, communication platforms, cultural shifts, consumer attitudes, and other factors. Therefore, researchers must take into account these elements while creating their diagnostic models to accurately reflect the dynamic connection between green marketing, consumer attitude, and purchasing behaviour [20]. To effectively reflect the entirety of consumer purchasing behavior in green marketing, diagnostic models must consider multiple elements

An IoT Based RFID Enabled Automatic Waste Segregator and Monitoring System

Abhishek Anand[1,*], Abhinav Shrivastav[1] and **Gunjan Aggrawal[1]**

[1] *Department of Computer Science Engineering Sharda University, Greater Noida, Uttar Pradesh 201310, India*

Abstract: The increasing population has led to a significant environmental issue: the proper disposal of a combination of biodegradable and non-biodegradable garbage. This issue is expected to persist as the global population continues to expand. The issue of waste treatment and management is a significant global concern across all geographical areas. The magnitude of its detrimental effects on our society and its environment is immense. The consequences of our haphazard and unregulated garbage disposal practices have become a significant issue for the well-being of both humans and the biodiversity of plant and animal species. By employing appropriate methods of segregation, it is possible to reuse and recycle trash efficiently. Indian Railways carries a daily average of 23 million passengers in India. This project presents a feasible prototype of an automated garbage segregator that efficiently manages the entire system using a microcontroller. The device is equipped with a range of sensors, primarily including an infrared (IR) sensor for detecting the presence of trash, a moisture sensor for detecting water content in the waste, and a metal sensor for detecting metallic waste. Therefore, these sensors are used to detect and identify the specific type of trash that is being disposed of. The microcontroller can regulate and oversee all operations of the system, including the proper disposal of garbage into certain bins categorized by metal, moist, and other materials. The project also focuses on implementing an incentive system that encourages the public to maintain a clean environment. It is achieved using a user-friendly RFID card scanning device, which rewards individuals with points for their efforts in disposing of waste properly. In addition, the entire system is supervised *via* the Wi-Fi module. The objective of this project is to offer a cost-efficient and financially viable alternative for waste management, therefore guaranteeing a pristine and healthful atmosphere. This application is a highly efficient tool for managing and organizing waste, as well as for separating different types of waste.

Keywords: Geographical, Microcontroller, RFID card scanning device, Trash, Waste management.

---

* **Corresponding author Abhishek Anand:** Department of Computer Science Engineering Sharda University, Greater Noida, Uttar Pradesh 201310, India; E-mail: abhishek@ug.sharda.ac.in

INTRODUCTION

Ensuring meticulous supervision and regulation of trash disposal is crucial to safeguarding human well-being and preventing environmental harm resulting from inappropriate waste management, which heightens the likelihood of ecological damage [1]. This work addresses several forms of garbage that contribute to environmental contamination, encompassing biodegradable food waste, foliage, and deceased animals, as well as non-biological waste like home plastics, bottles, nylon, and medical waste and biodegradable garbage [2]. The primary sources of garbage are industrial waste and domestic waste. This study largely examines domestic garbage, as individuals neglect to segregate waste into its elemental constituents [3].

The main sources of waste are industrial and domestic trash. Given the need for more effort by individuals to segregate their garbage into its fundamental constituents, this study primarily concentrates on household waste, which possesses an ambiguous value. Metals and non-biodegradable waste can be recycled, while organic waste can be employed for the production of biogas. Unmanaged metal waste is a hazard to both plant and animal species [4]. Rather than transporting waste to industrial facilities for first sorting, which is both time-consuming and results in ineffective waste sorting, a more efficient approach would be to sort the waste at the household level and send it straight for recycling. The utilization of X-rays and infrared rays in industrial trash sorting procedures presents a peril to human well-being. Inadequate waste management leads to well-documented and acknowledged environmental issues.

The objective of this project is to achieve a high level of efficiency and cost-effectiveness in the segregation of garbage into three distinct categories, namely wet, dry, and metallic, right at the point of origin [5]. It will be accomplished by employing infrared (IR), metallic, and rain sensors and further monitoring the system through the utilization of Internet of Things (IoT) technology. It will effectively mitigate the squandering of waste by enabling its conversion into a viable energy resource. The project also focuses on implementing an incentive system for the public to maintain cleanliness in their area [6]. It will be achieved using a user-friendly RFID card scanning device, which rewards individuals with points for their efforts in disposing of waste properly [7]. In addition, the entire system is monitored *via* a wireless fidelity (wi-fi) module [8]. The objective of this project is to offer a cost-efficient and budget-friendly approach to trash management, ultimately resulting in a pristine and sanitary environment.

RELATED WORKS

This system introduces an innovative method for garbage management by utilizing Radio Frequency Identification (RFID) and Internet of Things (IoT) technology [9]. The trash segmentation and monitoring system implements an automated waste segregation procedure that utilizes RFID sensors to secure and measure the quantity of garbage that is sorted into various bins based on its respective category [10]. This invention will enhance waste sorting by simplifying and expediting the process, as well as improving accuracy compared to current manual waste segregation methods. Additionally, it will offer comprehensive analytics to enable real-time tracking and monitoring of waste classification [11]. This aids in optimizing waste management and minimizing the likelihood of inadvertently discarding recyclable material [12].

Moreover, the technology enables remote waste monitoring, hence enhancing the efficiency of waste collection and disposal. Recent technological advancements have facilitated the development of robust computational models to enhance the management and monitoring of waste management systems [13]. An efficient waste management system is crucial for minimizing environmental harm and decreasing waste production through the promotion of trash sorting and recycling [14]. An example of an innovative computational model is Samsung's RFID-enabled Automatic Waste Segregator and Monitoring System. This system uses Radio Frequency Identification (RFID) tags to categorize and separate products according to their type, size, and other distinguishing features [15]. The system comprises an RFID reader, a database, a user interface, and a sensor-regulated waste container [16]. The RFID reader is mounted within the garbage collector's vehicle and scans every trash can that is transported on board. The reader discerns and retrieves data from all products that have been affixed with an RFID sticker. Subsequently, this data is transmitted to the back-end system, where it is stored and subjected to analysis [17]. The system's user interface facilitates the garbage collector in swiftly identifying and overseeing waste collection spots, enabling them to effectively organize their route while simultaneously monitoring the quantity of waste gathered. In addition, the user interface can display specific garbage and common waste using distinct colors [18]. This enables the garbage collector to conveniently assess the current quantity of waste on board and determine the collection priority. The popularity of developing Internet of Things (IoT) based RFID enabled Automatic Waste Segregator and Monitoring Systems has grown due to its user-friendly nature and potential for reducing costs. Prior to the implementation of such systems, it is imperative to create precise diagnostic models [19]. These models must take into account the diverse environmental, economic, and technical factors that impact the functioning and effectiveness of the system.

How to Reduce Environmental Cost by Green Accounting

Himanshu Kumar[1], Ashish Diwakar[1] and **Surbhi Agarwal[1,*]**

[1] *Depatment of Management Studies, Hi-Tech Institute of Engineering and Technology, Ghaziabad, (U.P.), India*

Abstract: The increasing apprehension regarding environmental sustainability has prompted a heightened focus on discovering methods to diminish the ecological expenses linked to commercial activities. One strategy that can be used is the adoption of green accounting, which aims to include environmental factors in conventional accounting approaches. This essay will contend that the implementation of green accounting techniques can substantially mitigate the environmental expenses incurred by firms. We shall substantiate this assertion by analyzing multiple objective factors, elucidating the concepts of green accounting, and outlining the potential advantages and obstacles linked to its adoption. In the subsequent paragraphs, I will initially elucidate the notion of green accounting and its significance in the contemporary day, subsequently, examine its potential in mitigating environmental expenses, and ultimately investigate obstacles and remedies for its widespread implementation.

Keywords: Environmental, Elucidating, Green accounting, Implementation, Mitigating, Sustainability.

INTRODUCTION

Green accounting pertains to the implementation of methods and goods that are ecologically sustainable [1]. The consideration of both the exhaustion of existing resources and the safeguarding of the environment is accompanied by an assessment of the associated costs and benefits [2]. It encompasses economic, social, and environmental integration. Incorporating green accounting into a national framework for economic accounts can facilitate the measurement of sustainability. In 1994, the National Academy of Sciences assessed the Integrated Satellite of Economic and Environmental Accounts, a method developed by the

---

* **Corresponding author Surbhi Agarwal:** Depatment of Management Studies, Hi-Tech Institute of Engineering and Technology, Ghaziabad, (U.P.), India; E-mail: surbhiagarwal060@gmail.com

Bureau of Economic Analysis for generating environmental accounts, notwithstanding its limited usage. Huhtala A. and Samakovlis E [3] (2016) performed the valuation of unquantified environmental services and goods incorporated into "green accounting," which also encompasses the assessment of emissions and natural resource accounts, disaggregating both traditional national accounts and green GDP [4]. To efficiently manage the supply chain is considered a crucial method for implementing green accounting. The phrases "environmental cost, valuation, and apportionment" are synonymous. Environmental accounting is the systematic procedure of identifying, quantifying, and distributing costs [5]. This accounting report includes the environmental expenses that are directly related to certain activities, such as the costs associated with legal liabilities and the costs of disposing of garbage. The director's report may cover several subjects, such as green accounting matters, policies, and progress [6]. The study conducted by Farouk *et al.* in 2016 has shown that the source of this accounting information is Schmalleger and Burritt's publication from the year 2000. The director's report may cover several subjects, such as green accounting concerns, policy, and progress [7]. The source of this accounting is Schmalleger and Burritt's publication in 2000. Ecological accounting examines the influence of the environment on a company's economic activities. Environmental management accounting plays a crucial role in collecting and analyzing diverse data related to environmental costs and associated expenses [8]. It also considers internal analysis and the management's informed decisions [9]. Green accounting primarily focuses on analyzing the changes and effects of different corporate processes as proposed by Garg, A., Agarwal, P., & Singh, S. (2023) . It also prepares to engage with external stakeholders.

RELATED WORKS

Green accounting is a form of accounting that entails assessing the ecological expenses linked to an organization's activities and implementing measures to mitigate them [10]. The uniqueness of green accounting resides in its ability to evaluate the ecological expenses linked to a business that goes beyond the usual measurements in conventional financial accounting [11]. This entails quantifying the financial implications of environmental expenses and utilizing this data to make informed choices on cost reduction and minimizing the organization's ecological footprint [12]. Green accounting is a variant of cost accounting that allows firms to quantify and disclose the ecological expenses associated with their operations. Green accounting enables firms to evaluate potential ecological expenses linked to production and consumption activities and offers a framework for integrating environmental consequences into investment choices [13]. It facilitates the advancement of more sustainable business practices by offering a method to evaluate the environmental impact of various operations, thereby

motivating organizations to implement strategies to diminish their ecological footprint [14]. The conventional approaches to green accounting have been constrained by the challenge of evaluating the ecological expenses linked to various activities. In recent times, significant progress in computer models and approaches has allowed businesses to accurately measure the environmental consequences of their operations with more precision [15]. By employing environmental impact assessment (EIA) technologies like life cycle assessment (LCA) and environmental economic models, firms can acquire knowledge about the ecological expenses associated with their operations and pinpoint potential avenues for enhancement [16]. Environmental Impact Assessment (EIA) techniques such as Life Cycle Assessment (LCA) enable organizations to comprehensively evaluate the environmental expenses linked to a product or system, encompassing the acquisition of raw materials and the disposal of old products [17]. Additionally, these tools help identify the specific components of the system that have a more significant or lower influence on the environment. This observation assists companies in recognizing areas of concern, such as the depletion of resources, pollution of air and water, and climate change. The environment plays a crucial role in the global economy, as numerous sectors rely on the natural resources and biodiversity it offers. Regrettably, environmental expenses are frequently disregarded, particularly in the context of financial bookkeeping. Consequently, Diagnostics Models for Green Accounting have emerged as a crucial instrument for recognizing these expenses and aiding enterprises, government bodies, and other stakeholders in diminishing their ecological costs [18]. Green Accounting is a methodology that enhances the comprehension of financial choices and their ecological consequences for businesses and other organizations. By employing Diagnostic Models for Green Accounting, companies, and corporations can effectively discern and comprehend the environmental expenses and advantageous outcomes associated with adopting eco-friendly practices. Several diagnostic models that might be used include Cost-Benefit Analysis, Life Cycle Assessment, and Impact Analysis. Cost-benefit analysis is a technique used to evaluate the potential benefits of a proposed action or policy in relation to its costs [19]. The diagnostic approach enables the identification of both the positive and negative impacts on the environment, allowing organizations to assess the environmental costs and benefits associated with proposed investments. Life Cycle Assessment (LCA) is a comprehensive evaluation method that analyzes the environmental implications of a product across its full life cycle, encompassing stages such as raw material extraction, production, and disposal. Companies are increasingly utilizing this instrument to ascertain and diminish the environmental expenses associated with their items. Impact Analysis enables companies to assess the environmental consequences of their operations. Green accounting examines the financial impact of

Comparison of the Efficiency of K-Means, GMM and EM Algorithms in Image Processing

Rashmi Sharma[1,*] and **Siddhartha Srivastava**[2]

[1] *Department of Information Technology, Ajay Kumar Gag Engineering College, Ghaziabad, UP, India*

Abstract: This study assesses the efficacy of three widely recognized picture clustering algorithms: K-Means Image processing is a crucial undertaking in various sectors, such as satellite images, surveillance, and medical imaging. Image clustering is the essential process in image processing when pixels with similar characteristics are grouped into clusters. This study assesses the performance of the K-Means Clustering, Gaussian Mixture Model (GMM), and Expectation-Maximization picture clustering algorithms. We evaluate the efficacy of these algorithms by comparing their effectiveness across different industries, taking into account numerous characteristics and their usability. While K-Means Clustering is pragmatic and uncomplicated, it may not yield satisfactory results when applied to images with non-uniformly distributed clusters or clusters of varying sizes. The GMM method exhibits greater flexibility and is capable of effectively processing intricate images of varying dimensions, as well as clusters that are not uniformly dispersed. Computing expenses for this method may exceed those of K-Means Clustering. Despite its increased processing cost, the iterative EM technique is capable of handling images that contain clusters with non-uniform distributions and clusters of varying sizes. This work performs a comparative analysis of various algorithms to assist researchers and practitioners in selecting the most optimal image-processing algorithm for a specific application.

Keywords: Distributions, Electromagnetic radiation, Expectation-maximization, Image-processing algorithm, *K-Means* clustering.

INTRODUCTION

In several domains, such as medical imaging, surveillance, satellite images, *etc*., image processing is applied widely. It involves editing and analysing digital photos to extract essential information or improve visual quality [1]. There are several applications for image processing, such as picture enhancement, segmentation, compression, recognition, and object detection. There are several

---

[*] **Corresponding author Rashmi Sharma:** Department of Information Technology, Ajay Kumar Gag Engineering College, Ghaziabad, UP, India; E-mail: drrashmisharma20@gamil.com

image processing algorithms, each with advantages and limitations. Frequent uses include the K-Means Clustering algorithm, the Gaussian Mixture Model algorithm, and the Expectation-Maximization algorithm. The K-Means Clustering algorithm is an easy and efficient image processing approach. However, it may not perform better on photos containing clusters of various sizes and distributions [2]. The Gaussian Mixture Model (GMM) approach is more versatile than K-Means Clustering because it can handle pictures with non-uniformly distributed clusters and clusters of varied sizes. However, it may be more expensive computationally than K-Means Clustering. The Expectation-Maximization (EM) method is a frequent iterative technique used with the GMM algorithm. It is more flexible than K-Means Clustering and can handle images with clusters of various sizes and non-uniform distribution. However, it may be more expensive computationally than K-Means Clustering [3]. In this study, we compare the efficacy of the K-Means Clustering, GMM, and EM algorithms based on numerous factors and their ease of implementation in diverse industries. The ideal algorithm for image processing depends on the application's requirements. While the K-Means Clustering technique is practical and uncomplicated, photos with non-uniformly distributed clusters or clusters of different sizes may require assistance [4, 5]. The GMM technique is more versatile than K-Means Clustering and can interpret complicated pictures, although it may be computationally more expensive The EM algorithm is an iterative method that can handle images with non-uniformly distributed clusters and clusters of various sizes, although it may entail a greater computing cost [6]. By comparing the K-Means Clustering, GMM, and EM algorithms, this work intends to aid researchers and practitioners in picking the appropriate image processing technique for their particular application.

RELATED WORKS

Picture processing has turned out to be a hot topic in the contemporary era. With the appearance of sophisticated computing structures, it has turned out to become more famous for using devices, gaining knowledge of algorithms for the system, and analyzing large amounts of imagery. Most of the most famous of those algorithms are okay-way, GMM (Gaussian mixture model), and EM (Expectation Maximization) algorithms. Each of those algorithms has precise advantageous and disadvantages, and their performance relies upon the particular project to be completed. This essay will compare the performance of okay-way, GMM, and EM algorithms in photograph processing and talk about the elements that contribute to their efficiency. The approach is a clustering algorithm where the intention is to discover the most reliable centroid of clusters of statistics factors in an image. It works by assigning factors to the closest centroid, after which iteratively recomposing the centroid's function inside the facts set until the

clusters are determined. The k-method is extraordinarily green in photo processing obligations since it requires fewer computations than other clustering algorithms. Additionally, its simplicity makes it well-appropriate for real-time photograph processing packages. GMM is a probabilistic set of rules that computes the probability that a given factor belongs to a given cluster. Unlike the K-method, GMM (Gaussian combination version) and EM (Expectation Maximization) are 3 algorithms that are typically utilized in photo processing. Every of these algorithms has its blessings and downsides, making them suitable for extraordinary packages and photo kinds. The k-method is a clustering algorithm, because of this; it divides statistics factors into clusters. It assigns every information factor to the nearest cluster center and updates the cluster centers every generation. Its miles the handiest and fastest algorithm of the three and is properly desirable for clustering large datasets. Okay-means works exceptionally on data that has a clean cluster structure and is well separated. GMM is a probabilistic clustering algorithm. With preference to assigning each factor to a single cluster, it estimates the opportunity that every factor belongs to each cluster. It makes it better at taking pictures of the nuances of more complicated record sets. GMM works satisfactorily on complicated and overlapping information clusters. EM is an iterative clustering algorithm. It works by maximizing the expectancy of the likelihood of the information factors belonging to their respective clusters. It permits it to be more than the easier k-manner and GMM algorithms. EM works high-quality on complex, overlapping, and excessive dimensional information.

LITERATURE REVIEW

Image segmentation methods have garnered significant attention across various industries, such as autonomous vehicles, security systems, medical imaging, and industrial inspection. The purpose of this literature review is to provide a comprehensive summary of recent research that has employed deep learning and clustering techniques for object detection and image segmentation. Kim and Jung (2020) proposed a K-means clustering-based image segmentation technique for industrial inspection [7]. The authors achieved promising outcomes through the segmentation of photos of industrial items. Du and Lou (2020) showcased a refined K-means clustering algorithm for medical picture segmentation that exhibited exceptional precision and resilience [8]. In 2021, Kim and Lee made enhancements to the Gaussian mixture model (GMM) technique used for picture segmentation [9]. They proposed a novel initialization technique that enhanced the accuracy of segmentation, as opposed to the traditional GMM approach. Li and Zhang (2021) developed a rapid picture segmentation method that achieved great efficiency and accuracy by incorporating GMM and local spatial information [10]. Li and Li (2021) proposed a deep-learning approach utilizing

Green Technology to Achieve Environmental Safety and Sufficient Development

Tanvi Agarwal[1], Vinay Kumar Agarwal[1,*], Santosh Kumar[1], Jully[1] and **Mohd. Naushad Ali[1]**

[1] *Department of Management, Hi-tech Institute of Engineering & Technology, Ghaziabad, India*

Abstract: This study centres on the concept of green technology, which has arisen as a response to the ecological imbalance it has endured. Therefore, the preservation of the environment has become a paramount global priority. An important factor contributing to this phenomenon is the emergence of ecological challenges. The scope of research on green technology includes the design, modification, and conversion of products with the aim of achieving sustainable development. It encompasses alterations in the product system, packaging procedure, and promotional efforts to promote environmental awareness among consumers. The primary focus of our society at present is to attain sustainable growth across all domains. The exploratory study examines the literature that substantiates the utilization of green technology and sustainable development to tackle contemporary environmental concerns. It encompasses the environmental welfare that arises from the socioeconomic need for ecologically friendly products and trends, which are intended to benefit both the present and future generations. Integrating green technology with sustainable development to safeguard the environment poses a challenging task.

Keywords: Ecological safety, Environmentally friendly technology, Green product, Sustainable development.

INTRODUCTION

It is believed that environmentally friendly technology is essential to the value chain process and the creative green force. Sustainable performance will result from green technology improvements, provided that we do not change our current perspectives on the use of technology [1]. The environmental, eco-technological, and green technology approach is a subset of the cluster that focuses on the differences between the ecological reliability of the environment and the conventional system [2]. Green technology has increasingly gained attention due

* **Corresponding author Vinay Kumar Agarwal:** Department of Management, Hi-tech Institute of Engineering & Technology, Ghaziabad, India; E-mail: vinayagarwal460@gmail.com

to its concern for both the environment and technology operation [3]. The core and the most important element of green technology is sustainability (Charter, 1992). The goal of the green approach to application and product, according to McDonough and Prather (1998), is to enjoy the existing standard of life without endangering future norms [4]. Suddenly, environmentalism has shown to be a global marvel. Environmental issues have become an occasion for manufacturing and product assiduity [5]. It is possible to turn this circumstance into profitability by enforcing green technology solutions. Technology problems are becoming the social impediments that environmental issues once posed. Van Dam and Apeldoorn (1996) assert that achieving sustainability is a social objective that will essentially change everyone's behaviour [6]. Fig. (**1**) shows that element of green technology.

Fig. (1). Green technology.

Among Indian consumers, green technology adoption is growing in popularity. As a result, the business association understands what green technology is. Numerous companies have accepted their responsibility and obligation to safeguard the region [7]. The phrase "go green" has been popularized by businesses that create environmentally friendly goods and adhere to production procedures that both lower pollution and increase profitability [8]. This mind-set is used by companies who produce green products that are acknowledged as green technology in order to meet market demand and alleviate environmental challenges [9].

Rationale of the paper: The purpose of this study paper is to reassess how technologies are addressing environmental concerns in the modern world by implementing a green technology plan to achieve sustainable development. This study article specifically focuses on the field of ecological technology.

Green technology: The need for green technology is pressing and inevitable (Pattie, 1992; Pierre & Prather, 1997; Growth, 1998). It refers to the act of manufacturing products with minimal adverse effects on the environment. Green technology has emerged as a vital concept, not just in India but also in other developing nations. It is seen as an essential strategy to promote sustainable development. Consequently, manufacturers have started producing environmentally sustainable products, which can enhance their market share and the business's reputation for being environmentally conscious in society. Currently, there is an abundance of terms employed by marketers to articulate the ecological advantages of their products and services. The phrase "green" is commonly used as a broad category to describe things that are natural, recyclable, and do not cause harm to the earth or the environment. In recent decades, there has been a notable shift in consumer purchasing patterns, inclinations, and interests toward environmentally friendly items. Moreover, it has sparked a surge in customer curiosity regarding the distinctiveness of environmentally-friendly products. Companies should capitalize on these opportunities to demonstrate the environmental friendliness of their products and their superiority over competitor products. In recent times, marketers have recognized the significance of environmental management as a strategic instrument for addressing environmental obstacles and cultivating green business prospects. Ecological degradation and unethical industry practices have contributed to the increasing complexity of our civilization. Both customers and companies share a common commitment to environmental protection. Consequently, there is a change in an individual's purchasing behaviours. Therefore, there has been a change in inclination towards environmentally friendly products that are superior to conventional ones (Maritain & Diamond, 2005) [10]. A corporation has emerged as a consequence of this transition to address the "novel" challenges confronting society. Contemporary organizations recognize that the sole path to success is to

Electrical Insulating Properties of Epoxy Modified Shellac Polyamide Resin Blends

Praveen Chandra Jha[1,*] and **Pankaj Kumar Mishra**[2]

[1] *I.T.S. Engineering College, Greater Noida-201308, Uttar Pradesh, India*

[2] *Hi Tech Institute of Engineering and Technology, Ghaziabad, Uttar Pradesh, India*

Abstract: The electrical insulating properties of various blends of epoxy-modified Shellac Polyamide resin blends were investigated and it has been found that all the weaknesses of shellac can be overcome. It has also been observed that these blends retain (or rather enhance) good electrical insulating properties of shellac, by suitably blending with these resins.

Keywords: Dielectric strength, Epoxy resin, Polyamide resin, Shellac, Tracking resistance.

INTRODUCTION

Electrical insulating varnishes are widely used in the electrical industry for coating of armatures/coils of electrical motors, and transformers, and also for finishing electrical components such as resistors, field magnets of electric motors, *etc.* The main role of the varnishes is to prevent the flow of current through undesired paths, to isolate parts maintained at different potentials as well as to protect from environmental conditions. Depending on various applications, insulating materials are required to comply with various requirements. In the polymer industry, a large number of composites were made by mixing and blending together different polymers and resins to achieve the desirable combination of properties of the formed blend [1 - 4].

Shellac has enormous potential to be compatible with polar polymers. There is a good scope in imparting some of Shellac's excellent qualities *e.g.* adhesion to a variety of substrates, unique film forming capability (with very low mol wt of 1000), resistance to hydrocarbon solvents, good scratch hardness, excellent dielectric properties, and tracking resistance, excellent stability towards UV radi-

---

* **Corresponding author Praveen Chandra Jha:** I.T.S. Engineering College, Greater Noida-201308, Uttar Pradesh, India; E-mail: pcjha1975@gmail.com

ations, high thermal resistance/stability, flexibility, and resistance to the humidity of the synthetic polymer resins. In these combinations, it might be possible to retain all the advantageous characteristics of both resins. Shellac, although possesses excellent electrical properties, is known to have very low thermal resistance (65-75^0C), with the brittleness of the film and poor resistance towards water/humidity. The use of shellac as an electrical insulating varnish was, therefore restricted to above mentioned weaknesses in spite of the excellent dielectric properties it possesses [5-7].

Researchers have made constant efforts to utilize the useful combinations of properties of shellac by reacting it with various compounds to inhibit its weaknesses and to form a useful combination of blends for its use in the electrical industry. Early research was conducted on modified shellac with casein or vegetable proteins and formaldehyde with phenol, aniline, coltar, and cashew nut shell liquid [8 - 14].

Blends of shellac with butylated melamine formaldehyde (BMF), butylated urea formaldehyde (BUF), epoxy, and phenolic resins have been used. B.M.F. was found to provide increased thermal resistance (up to 100^0C) to shellac films (65-70^0C), imparted hardness, and resistance to spirituous liquor. The dielectric strength of shellac BMF and shellac BUF blends was doubled (80 kv/mm) compared to that of shellac (36-48 kv/mm). Film properties of shellac–BMF resin varnishes do not meet the specifications of B.I.S. with regard to tracking resistance.

The film properties of shellac epoxy resin varnish were found to be better as it uses shellac with epoxy resin for drying oil [15 - 24].

In recent years, shellac has attracted increasing attention to developing novel materials due to its versatile nature and its compatibility with various functional polymers [25 - 28].

EXPERIMENTAL

A commercial variety of shellac with a flow value of not less than 50, obtained from M. L. Trading Co. Delhi and Polyamide and Epoxy resins, obtained from Nirmal Singh and brothers, Karol Bagh Delhi, were used in the study. A solvent mixture of n-butanol (analytical Grade) and Xylene (analytical Grade) was prepared in the desired ratio. Now shellac, Epoxy and Polyamide resins were dissolved in defined ratios separately in the prepared solvent mixture and then blended in the requisite proportions and kept at room temperature for at least 10 days before studying the electrical insulating properties of various blends.

Dilution Ability or Compatibility

The test was carried out at room temperature. A measured amount of varnish was taken in a Stoppard measuring cylinder. An equal amount of thinner (Xylene and n-butanol mixture in a 1:1 ratio) was added to the varnish and shaken. Then this prepared mass was kept at normal room temp. After some time, it was observed that no white Cloudiness or phase separation occurred. After that, half the amount of thinner was added to this mixture again and the mixture was shaken and allowed to rest. This process was repeated again and again till phase separation or white Cloudiness was observed. Then we reported the result as the maximum volume of the thinner added before the cloudiness appears. It was found that the % dilution ability of epoxy-modified shellac – Polyamide resin varnish was more than 300%.

Effect of Varnish on Enameled Wire

Six straight pieces of enameled wire about 150mm in length having a diameter of 1.0mm with medium covering were used in this test. These test specimens were heated for about 10min at 130^0C. Now these enameled wires are dipped in a sufficient amount of prepared varnish solution so that a major portion of the wires can be dipped. These varnish samples were placed in a temperature-controlled oven at about 60 ± 3^0C. The enameled wire samples (3 pieces each) were immersed in the two varnishes for 30 minutes, within defined temperature conditions. These enameled wire samples were subjected to pencil hardness determination after removal from the varnishes.

These enameled wire samples were taken flat on the table and normal lead pencils with specified hardness were subjected at an approximate angle of sixty over wire samples. The subject force of approximately 5N was applied. The hardness index was taken as the highest number, which failed to remove the enamel from the enameled wire. It was found that the effect of varnish of Epoxy modified shellac – Polyamide resin varnish was more than 6H.

Tracking Resistance Test

The tracking resistance test normally indicates the behavior of coated and baked varnishes with reference to their possibility of surface tracking when they are exposed to electric stress in the presence of an electrolyte. In this test, pieces of Bakelite sheets (approx. 24 mil thickness) having dimensions of 6cm x 5cm were coated with two insulating varnishes so that both sides of the sheet have a minimum of 3 mils of coating, by the recoating process. The anti-tracking properties were determined using the Beckman tracking resistance test- set by applying various voltages to the electrodes, which produce electrical discharges,

Electrical Insulating Properties of Epoxy-Modified Shellac Alkyd Resin Blends

Praveen Chandra Jha[1,*] and **Shalin Kumar[2]**

[1] *I.T.S. Engineering College, Greater Noida-201308, Uttar Pradesh, India*

[2] *Hi Tech Institute of Engineering and Technology, Ghaziabad, Uttar Pradesh, India*

Abstract: The electrical insulating properties of various blends of epoxy-modified Shellac Alkyd resin blends were investigated and it was found that all the weaknesses of shellac can be overcome. It has also been observed that these blends retain (or rather enhance), all the good electrical insulating properties of shellac, by suitably blending with these resins.

Keywords: Alkyd resin, Dielectric strength, Epoxy resin, Shellac, Tracking resistance.

INTRODUCTION

Electrical insulating varnishes are widely used in the electrical industry for coating armatures/coils of electrical motors, and transformers, and also for finishing electrical components such as resistors, field magnets of electric motors, *etc*. The main role of the varnishes is to prevent the flow of current through undesired paths, to isolate parts maintained at different potentials as well as to protect from environmental conditions. Depending on various applications, insulating materials are required to comply with various requirements. In the polymer industry, a large no of composites were made by mixing and blending together different polymers and resins to achieve a desirable combination of properties of the formed blend [1-4].

Shellac has enormous potential to be compatible with polar polymers. There is a good scope in imparting some of Shellac's excellent qualities *e.g.* adhesion to a variety of substrates unique film forming capability (with having very low mol wt of 1000), resistance to hydrocarbon solvents, good scratch hardness excellent dielectric properties and tracking resistance, excellent stability towards UV radia-

---

[*] **Corresponding author Praveen Chandra Jha:** I.T.S. Engineering College, Greater Noida-201308, Uttar Pradesh, India; E-mail: pcjha1975@gmail.com

tions *etc*. to the high thermal resistance/stability, flexibility, and resistance to humidity of the synthetic polymer resins. In these combinations, it might be possible to retain all the advantageous characteristics of both resins. Shellac although possesses excellent electrical properties, is known to possess very low thermal resistance (65-75^{0}C), brittleness of the film, and poor resistance towards water/humidity. The use of shellac as an electrical insulating varnish was, therefore restricted to above-mentioned weaknesses in spite of the excellent dielectric properties it possesses [5 - 7].

Researchers have made constant efforts to utilize the useful combinations of properties of shellac by reacting it with various compounds to inhibit its weaknesses and to form a useful combination of blends for its use in the electrical industry. Early research in modified shellac with casein or vegetable proteins and formaldehyde with formaldehyde and phenol, aniline, coltar, and cashew nut shell liquid [8 - 14].

Blends of shellac with butylated melamine formaldehyde (BMF), butylated urea formaldehyde (BUF), epoxy, and phenolic resins. B.M.F. was found to provide increased thermal resistance (up to 100^{0}C) to shellac films (65-70^{0}C), imparted hardness, and resistance to spirituous liquor. The dielectric strength of shellac BMF and shellac BUF blends was doubled (80 kv/mm) compared to that of shellac (36-48 kv/mm). Film properties of shellac – BMF resin varnishes do not meet the specifications of B.I.S. with regard to tracking resistance. Film properties of shellac epoxy resin varnish were found to be better which are been formed by reacting shellac with epoxy resin in drying oil [15-24].

In recent years, shellac has attracted increasing attention to developing novel materials due to its versatile nature and its compatibility with various functional polymers [25-28].

EXPERIMENTAL

A commercial variety of shellac with a flow value not less than 50 obtained from M. L. Trading Co. Delhi and alkyd and Epoxy resins obtained from Nirmal Singh and brothers, Karol Bagh Delhi, were used in the study. A solvent mixture of n-butanol (analytical Grade) and Xylene (analytical Grade) was prepared in the desired ratio. Now shellac, epoxy, and alkyd resins were dissolved in defined ratios separately in the prepared solvent mixture and then blended in the requisite proportions and kept at room temperature for at least 10 days before the study of the electrical insulating properties of various blends.

Dilution Ability or Compatibility

The test was carried out at room temperature. A measured amount of varnish was taken in a Stoppard measuring cylinder. An equal amount of thinner (Xylene and n-butanol mixture in a 1:1 ratio) was added to the varnish and shaken. Then this prepared mass was kept at normal room temp. After some time it was observed that no white Cloudiness or phase separation occurred. Now after that, half the amount of thinner was added to this mixture again and the mixture was shaken and allowed to rest. This process was repeated again and again till phase separation or white cloudiness was observed. It was found that the % dilution ability of epoxy-modified shellac-alkyd resin varnish was more than 300%.

Effect of Varnish on Enameled Wire

Six straight pieces of enameled wire about 150mm in length having a diameter of 1.0mm with medium covering were used in this test. These test specimens were heated for about 10min at 130^0C. Now these enameled wires were dipped in a sufficient amount of prepared varnish solution so that a major portion of the wires can be dipped. These varnish samples were placed in a temperature-controlled oven at about 60 ± 3^0C. The enameled wire samples (3 pieces each) were immersed in the two varnishes for 30 minutes, within defined temperature conditions. These enameled wire samples after removal from the varnishes were subjected to pencil hardness determination.

These enameled wire samples were taken flat on the table and normal lead pencils with specified hardness were subjected at an approximate angle of sixty over wire samples. The subject force of approximately 5N was applied. The hardness index was taken as the highest number, which fails to remove the enamel from the enameled wire. It was found that the effect of varnish of Epoxy modified shellac – alkyd resin varnish is more than 6H.

Dielectric Strength Tests

The various blends were coated on mild steel plates by simple draining and flow method and after sufficient draining, the coated plates were baked as per their baking schedule in a well-ventilated oven. Measurement of dielectric strength of the blends was carried out following Laxminarayanan *et al.* The rapid application of the defined voltage method was used in the determination of dielectric strength. At normal room temperature, many dielectric tests can be carried out on one side of the baked varnished panels, and after dipping it for 24 hrs in water and then removing it at room temperature, one test is carried out on the other side.

Recognition of Characters of New-born Baby's Fingerprinting Using Machine Learning

Arun Kumar Singh[1,*]

[1] *Department of Computer Science and Engineering, Greater Noida Institute of Technology, Greater Noida, 201310, Uttar Pradesh, India*

Abstract: The ability to recognize fingerprints properly and quickly has been possible thanks to the development of machine learning (ML) techniques, which have revolutionized the biometric identification field. In this research work, we offer a machine-learning method for character recognition in newborn fingerprints. A collection of newborn fingerprint photos with known demographics (gender, age, and ethnicity) was gathered, and the images were pre-processed to improve contrast and reduce noise. Relevant information was extracted from the photos using feature extraction techniques, and machine learning (ML) algorithms like support vector machines (SVM), decision trees (DT), and neural networks (NN) were trained to identify the distinctive fingerprint traits of a newborn. The results of the study showed that the recommended method, which employs ML algorithms, can correctly recognize the characteristics of a newborn baby's fingerprints. Just a few of the metrics utilized to assess each ML model's performance in a hold-out validation situation were precision, recall, and F1 score. The decision tree achieved an 89% success rate, the neural network achieved 94% success rate, and the SVM algorithm achieved the success rate of 92%. These findings suggest that ML algorithms can quickly and accurately recognize the characters in a newborn baby's fingerprints. The suggested approach has numerous uses in security and healthcare systems where precise identification is essential. Accurate infant identification is essential in the healthcare industry to guarantee proper medical care and avoid medical errors. Access control in security systems can be implemented with fingerprint recognition. This study advances the use of machine learning (ML) to recognize characters in newborn baby fingerprints more accurately and efficiently. The results could have a big impact on security and healthcare systems. The suggested technique, which makes use of machine learning techniques, can quickly and precisely identify the characters in a newborn baby's fingerprints. This study adds to the development of more precise and effective techniques for the recognition of newborn baby fingerprint characters, highlighting the potential uses of machine learning in healthcare and security systems.

Keywords: Decision Trees, Extraction techniques, Fingerprint Characters, Healthcare, Recommended Method.

* **Corresponding author Arun Kumar Singh:** Department of Computer Science and Engineering, Greater Noida Institute of Technology, Greater Noida, 201310, Uttar Pradesh, India; E-mail: arun.k.singh.iiit@gmail.com

INTRODUCTION

Although fingerprints are unique, fingerprint recognition is a widely used biometric identification technique. For many years, fingerprint recognition has been utilized in a variety of settings, including criminal investigations, access control systems, and healthcare systems. The advancement of machine learning (ML) algorithms has made it feasible to train models that swiftly and precisely recognize fingerprints. Precise patient identification is essential in healthcare systems to provide appropriate medical care and avoid medical mistakes. Precise identification of infants is essential for guaranteeing their security and safety in nurseries and hospitals. Because each fingerprint is different, fingerprint recognition provides a dependable means of identification in healthcare systems [1]. Recent years have seen excellent results from ML algorithms in a number of useful applications, including speech recognition, image recognition, and natural language processing [2]. ML algorithms forecast and make judgments by using the patterns and relationships they discover in data. In this research work, we offer a machine-learning method for character recognition in newborn fingerprints [3]. The suggested approach has a lot of potential uses in security and healthcare systems, where precise identification is essential.

Dataset Collection and Preprocessing

Building ML models for fingerprint recognition involves a critical stage in the process: gathering and preparing datasets. In order to train the machine learning model, the dataset needs to have a significant number of photos and should be representative of the target population. Gathering a dataset of newborn fingerprint photos with known demographic data, like gender, age, and ethnicity, is crucial for new-born fingerprint recognition. FVC2000, FVC2002, and FVC2004 datasets are a few publicly accessible datasets that can be utilized for fingerprint recognition. Nevertheless, the majority of the fingerprints in these datasets are those of adults; datasets devoted to the fingerprints of newborn babies are scarce. As a result, researchers need to gather their data. The fingerprint scanner can be used to gather the dataset.

Feature Extraction

Feature extraction plays a crucial role in the development of fingerprint recognition models that utilize machine learning. Feature extraction methods are used to extract pertinent data, such as the orientation and frequency of ridge patterns, from the fingerprint photos. The obtained features are inputted into a machine learning algorithm to enhance its fingerprint identification skills. Various feature extraction techniques are employed in fingerprint recognition, including the orientation coherence matrix and Gabor filter bank. The orientation coherence

matrix can be utilized to obtain the orientation field of the fingerprint. The orientation field in a fingerprint image denotes the inclination of the ridges. In order to compute the orientation coherence matrix, the gradient of the image is initially computed, which is then followed by the determination of the orientation field for each individual pixel. Next, we employ the orientation coherence matrix to ascertain the principal orientation of the fingerprint. The Gabor filter bank is a technique used to extract frequency information from the patterns of ridges in fingerprints. To capture the local texture information of the fingerprint, a set of Gabor filters is utilized. Multiple orientations and sizes of Gabor filters are employed to extract characteristics from the fingerprint image for the model. The study conducted by Metre *et al*. (2018) employed a fusion of the orientation coherence matrix and Gabor filter bank to extract features in fingerprint recognition. The orientation coherence matrix was employed to derive the orientation field, while the Gabor filter bank was utilized to retrieve the frequency information of the ridge patterns. The retrieved characteristics were subsequently employed to train a support vector machine (SVM) for the purpose of fingerprint identification. Tatar, a fusion of the orientation coherence matrix and local binary patterns (LBP) was employed for extracting features in fingerprint recognition. The Local Binary Patterns (LBP) approach was employed to retrieve the texture information from the fingerprint. The features that were retrieved were subsequently utilized to train a decision tree algorithm for the purpose of fingerprint recognition (Tatar *et al*., 2019). To summarize, feature extraction techniques such as the orientation coherence matrix and Gabor filter bank are employed to extract pertinent data from fingerprint images in order to achieve precise fingerprint recognition. The collected characteristics are subsequently employed to train machine learning models, such as Support Vector Machines (SVMs) and decision trees, for the purpose of fingerprint recognition.

RELATED WORKS

The use of Machine Learning in the verification of newborn fingerprinting has become more famous in recent years due to its accuracy and performance. Through machine learning, healthcare specialists can test a new child's fingerprints fast and reliably, bearing in mind more accurate identification techniques for kids being admitted to medical centres, monitoring vaccines, and registering a toddler's identification for life. Through the application of advanced computer vision algorithms, the device is capable of rapidly identifying and differentiating the unique characteristics of individual fingerprints. Utilizing image processing techniques to detect minutiae points—distinctive features inherent to each fingerprint—machine learning algorithms are employed to analyze vast amounts of data. This data is then compared against an existing database, facilitating accurate and efficient fingerprint recognition. The trivialities

Exploring Deep Learning Techniques for Accurate 3D Facial Expression Recognition

Piyush Sharma[1,*], Shubhangi Singh[1] and **Hoor Fatima[1]**

[1] *Computer Science & Technology, Sharda University, Greater Noida, (U.P.), India*

Abstract: The potential of facial expression recognition (FER) in a variety of domains, including psychology, human-computer interaction, and security systems, has drawn a lot of attention in recent years. However, the majority of FER systems now in use can only identify facial expressions in 2D photos or movies, which can reduce their robustness and accuracy. In this paper, we propose a 3D FER system that enhances the accuracy of facial expression recognition through deep learning techniques. Though FER is becoming more and more popular, there are still several issues with the present systems, like poor handling of various stances, occlusions, and illumination fluctuations. Furthermore, more study needs to be done on 3D FER, which can yield more thorough and precise results. Long short-term memory networks (LSTMs) are used to map the temporal correlations between facial expressions. In contrast, convolutional neural networks (CNNs) are utilized to extract significant features from 3D face data in order to overcome these issues. We propose to record the dependencies. We provide an ensemble model that combines CNN's and its LSTM networks' advantages. The experimental results demonstrate that our proposed 3D FER system achieves over 80% accuracy on published datasets, outperforming current state-of-te-art 2D FER systems. This reveals that as compared to individual CNN and LSTM models, the suggested ensemble model likewise greatly increases detection accuracy. In conclusion, this study shows the promise of 3D FER systems and suggests a deep learning-based method to enhance the precision and resilience of facial expression detection. The suggested technique can be applied to a number of tasks where precise facial expression identification is necessary, including virtual reality, avatar animation, and emotion detection.

Keywords: Animation, Emotion detection, Experimental, Outperforming, Psychology.

INTRODUCTION

Facial expressions play a crucial role in human communication by allowing us to convey emotions, transmit information, and develop social bonds. The precise

[*] **Corresponding author Piyush Sharma:** Computer Science & Technology, Sharda University, Greater Noida, (U.P.), India; E-mail: piyush.sharma.code@gmail.com

identification of facial expressions has a wide range of practical uses in areas such as psychology, human-computer interaction, and robotics. Conventional approaches to facial expression recognition (FER) [1] have depended on 2D images, which are limited in their ability to capture the complete spectrum of facial motions and expressions. Recent breakthroughs in 3D imaging technologies have enabled the capturing of highly intricate and subtle facial expressions in three-dimensional space. Hence, there is an increasing demand for the creation of resilient and precise 3D Facial Expression Recognition (FER) systems in order to capture the intricacies of human facial expressions and enhance our comprehension of human communication [2].

RELATED WORKS

In the present day age, the facial recognition era is becoming more crucial. With improvements in deep knowledge, laptop structures have been capable of attaining an excessive stage of accuracy with incredibly low attempts within the recognition of faces. As facial popularity technology continues to improve, it's essential to remember the accuracy of three-D facial expressions as well. In this essay, I will discuss the capacity of deep knowledge techniques for accurate 3-D facial feature recognition. The first step in exploring deep knowledge of techniques for three-D facial popularity is to take into account the styles of statistics points needed to become aware of a face correctly. A three-D facial reputation system may use a diffusion of facts points together with facial geometry, action devices, and facial functions. Facial geometry records factors that can locate the shapes and sizes of various facial features, which include the eyes, nostrils, and mouth. Movement devices record facial muscle moves that are related to certain emotions. Subsequently, facial functions are greater targeted features such as eyebrows, nostril form, and chin form. As soon as facts and factors have been accumulated, the next step is to apply deep knowledge of algorithms to research and become aware of the functions of a face. Deep learning algorithms can be used to recognize facial expressions by means of comparing the record factors from distinct facial expressions and figuring out styles. For example, exploring deep mastering strategies for correcting three-D facial features reputation is a research subject that explores how to use deep mastering techniques to enhance the accuracy of facial feature recognition from 3-d snapshots. This research aims to broaden correct facial features popularity devices and the use of 3-D imaging that could identify a range of expressions, including happiness, joy, marvel, unhappiness, anger, worry, and disgust from 3-D pics. The approach used is to broaden a deep knowledge architecture, which may be used to locate facial expressions from three-D photos mechanically. This study aims to enhance the accuracy of facial feature recognition systems by exploring the use of deep learning strategies and algorithms. The regions of studies include:

3D facial landmark extraction.

3D facial features recognition.

3D characteristic extraction and class.

Deep knowledge structure design.

BACKGROUND

Emotions are commonly described as intricate psychological states that encompass illogical feelings, psychological shifts, and behavioral responses. They are integral to the human experience and greatly influence our perception, cognition, behavior, and interaction with the environment. Emotions have a vital role in human beings, as our survival and welfare rely on our capacity to experience them. They facilitate our adjustment to various circumstances, react to dangers, and convey our goals and emotions to others. Additionally, they facilitate the establishment of interpersonal relationships, enabling our psychological and emotional development. Animals do indeed have emotions, but what distinguish humans from other animals are their high cognitive capacities, language, and culture. Individuals can undergo a broader spectrum of emotions, encompassing the seven fundamental emotions, namely anger, contempt, fear, disgust, happiness, sadness, and surprise, as well as more intricate emotions such as love, jealousy, humiliation, and so on. Furthermore, humans possess the capacity to contemplate and control their emotions, which serves as an additional factor. Individuals possess the capacity to recognize and classify their emotions, understand the factors that trigger them and the consequences they bring, and manage their emotional responses using various strategies such as cognitive reappraisal, relaxation techniques, and social assistance. These ways aid in effectively dealing with challenging circumstances. The most conspicuous manifestations of people's emotions are their facial expressions. Facial Expression Recognition (FER) is a complex and time-consuming process. However, it has various practical applications, such as in human-computer interaction, healthcare, and sentient robots. Although FER's developments enhance its effectiveness, achieving high accuracy remains a challenging accomplishment. Scientists from several global locations have contributed datasets and a concise overview of the development of systems for recognizing facial expressions of emotion. There are a wide range of Facial Expression Recognition (FER) algorithms available, which include both traditional state-of-the-art algorithms and Deep Learning (DL)-based algorithms proposed by several researchers up until the year 2020. In a 1978 publication by Basil, the concept of emotion detection was initially introduced. This work categorized emotions into six primary expressions: happiness, sorrow, fear, surprise, fury, and disgust. The authors utilized a range of methodologies,

Health Screening Analysis Using Machine Learning

Pankaj Kumar[1], Vipin Kumar Pal[1,*], Dhruv Verma[1], Manasvi Agarwal[1], Mansi Jain[1] and Harsh Panwar[1]

[1] *Computer Science and Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, U.P, India*

Abstract: Humans with haemophiliac illnesses are unable to produce melatonin. The blood sugar level is either unusually high or low for a brief period. This disease can easily spread to humans and can become severe if left untreated. Numerous factors, including advanced age, genetics, elevated blood pressure, inactivity, *etc.*, might cause it to happen. The industry has enormous amounts of data because this is a prevalent condition; some ways to reduce the number ofaffected people include the use big data analysis and machine learning. To achieve uniform classification , we present a prediction model based on machine learning algorithms in this study.

Keywords: Algorithms, Genetics, Haemophiliac, Inactivity, Melatonin.

INTRODUCTION

Over the last 10 years, technology has advanced significantly and grown to play an essential role in human life. Haemophiliac disease is a ductless gland disorder that can arise from various causes, such as irregularities in metabolism. Compared to those without diabetes, those with diabetes are more likely to get other illnesses. The heart, eyes, kidneys, neurological system, *etc.*, are among the organs that are frequently impacted. Diabetes also affects the blood's haemoglobin percentage, which has an impact on blood circulation and hinders the body's ability to heal other wounds [1].

Type 1 primarily affects young people and teenagers. It is also known as Insulin Dependent Diabetes (IDDM) or Juvenile Diabetes. Because a person cannot ma-

* **Corresponding author Vipin Kumar Pal:** Computer Science and Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, U.P, India; E-mail: vipincs2005@gmail.com

nufacture the necessary amount of insulin, an external source of insulin is supplied. This is the cause of type 1 diabetes [2]. The term "NIDDM" refers to type 2 diabetes. It is the most prevalent kind of diabetes, characterized by low insulin levels, insulin resistance, and hyperglycaemia. It appears to happen when body cells are unable to use insulin as needed. Fig. (**1**) shows the association rule for the classification of type-2 diabetic patients.
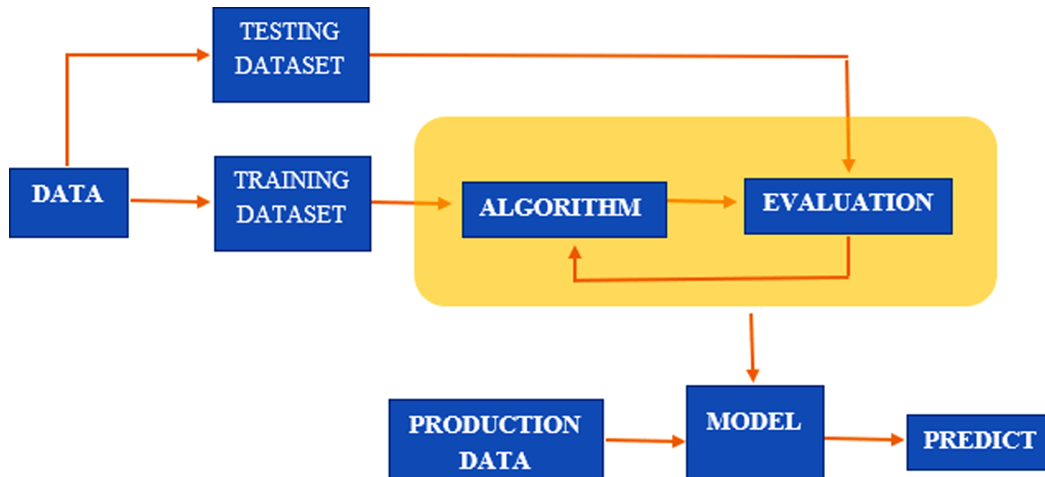
Fig. (1).   B.M. Patel, R.C. Joshi, and Dura Toshniwal, "Association Rule for Classification of Type-2 Diabetic Patients", ICMLC '10 Proceedings of the 2010 Second International Conference on Machine Learning and Computing, February 09 - 11, 2010 [3].

RELATED WORKS

A large number of people have already worked on this topic. Numerous scholars and philosophers have produced a large number of research papers that have been published. We are all familiar with the name breast cancer [4]. In 2018, a research was conducted, and methods were implemented in the recommended model by Vishabh Goal [5], a specialist in machine learning model construction. Here is the link to the same. In a similar vein, Shania Kennedy conducted studies on early cancer detection in 2019 [6]. Her article, which discussed the onset of oral cavity squamous cell carcinoma, a kind of oral cavity cancer, was published in JAMA Network Open. In her study, techniques related to machine learning were used to address real-world issues [7]. A global survey that was published in The Lancet in 2021 indicated that 537 million people worldwide had diabetes in 2021 [8, 9], nearly doubling the number of persons with the condition over the previous three decades. Diabetes was more prevalent in low- and middle-income nations.

ALGORITHMS

Numerous machine learning methods and data analysis approaches are also used to determine whether the dataset is balanced and whether the data is arranged for the click's predictions [10].

Logistic Regression

One statistical technique that can be used to ascertain the association between variables and outcomes is logistic regression. This kind of regression analysis has a dependent variable that can only have two possible values, binary or dichotomous (0 or 1). The logistic regression model fits a sigmoid curve to the data in order to calculate the likelihood that the desired event will occur [11]. A probability score that is produced using logistic regression can be utilized to forecast a binary result. Many industries, including marketing, healthcare, and the social sciences, employ logistic regression extensively to forecast the possibility of an event or result [12]. When it comes to classification jobs, logistic regression is a simple and suitable method that is widely utilized in many applications, such as forecasting the likelihood that a client would leave, identifying spam emails, and diagnosing medical issues [13]. Fig. (**2**) shows Type 1 diabetes.
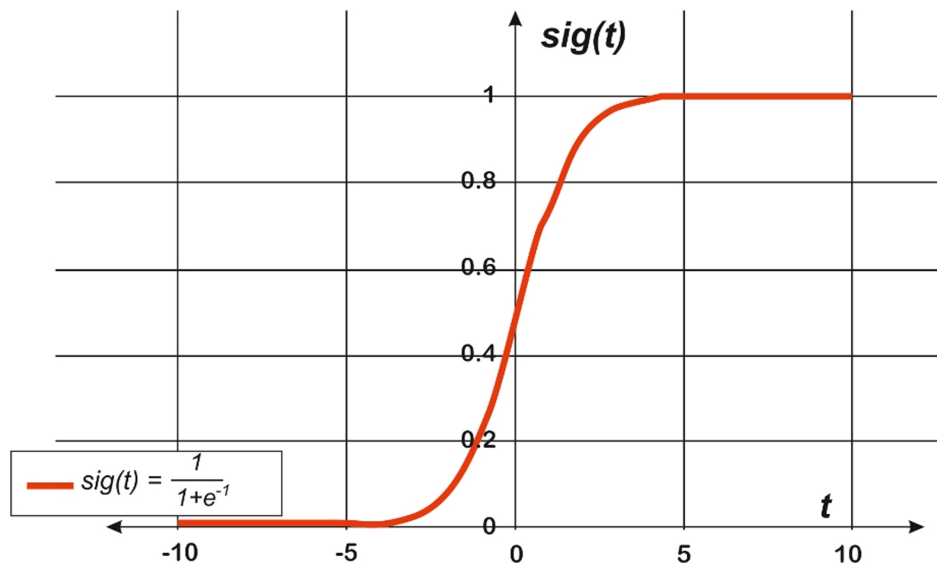

Fig. (2). Mark A Atkinson, Ph.D., Prof, George S Eisner Barth, MD, Prof, and Aaron W Michel's, MD 'Type 1 diabetes'.

$$Sigm(t) = 1 / 1+e\text{-}t \quad (1)$$

Blockchain Based Academic Certificate Authentication System

Vipin Kumar Pal[1,*], Pankaj Kumar[1], Nitin Vera[1], Ritik Manga[1], Rishabh Kumar[1] and **Ritesh Gautama[1]**

[1] *Computer Science and Engineering, Hi-Tech Institute of Engineering & Technology, Ghaziabad, U.P, India*

Abstract: In recent years, blockchain technology has emerged as a reliable and secure means of transmitting and storing data. One potential method for ensuring secure and unalterable data is by implementing blockchain technology within the certificate validation mechanism. This paper offers a comprehensive analysis of the utilization of blockchain technology to establish a reliable, efficient, and fraud-resistant method for validating certificates. The article covers many components of the system, including the blockchain network, smart contracts, and cryptography techniques. The paper also examines the potential benefits and challenges associated with implementing such a system.

Keywords: Blockchain, Comprehensive, Fraud-resistant, Transmitting, Technology.

INTRODUCTION

The traditional method of certificate validation, which relies on a centralized authority, is susceptible to fraudulent activities, therefore compromising the integrity and reliability of the system. The emergence of blockchain technology provides a feasible method for constructing a secure and reliable certificate validation system. This paper aims to provide a comprehensive analysis of the potential applications of blockchain technology in developing a secure, decentralized, and efficient system for validating certificates, ensuring their integrity, and preventing unauthorized alterations [1]. The paper examines several system components, including the blockchain network, smart contracts, and cryp-

---

[*] **Corresponding author Vipin Kumar Pal:** Computer Science and Engineering ,Hi-Tech Institute of Engineering & Technology, Ghaziabad, U.P, India; E-mail: vipincs2005@gmail.com

tographic techniques, and assesses the potential benefits and challenges associated with implementing such a system [2, 3]. The study highlights the necessity of implementing a certificate validation system based on blockchain technology to enhance the security, transparency, and efficiency of the validation process.

RELATED WORKS

The blockchain-based academic certificate authentication system is an emerging era designed to help verify the authenticity of educational credentials. This gadget is part of a larger fashion of the use of digital currencies and allotted ledgers to enhance the security and verifiability of records [4]. The generation provides an easy and immutable platform for establishments to affirm the validity of instructional credentials . The system of issuing and authenticating instructional credentials may require a lot of work involving multiple stakeholders. This method is also liable to mistakes and mismanagement [5]. The Block chain-based instructional certificates Authentication gadget gives a revolutionary solution to this hassle through a relaxed platform to store and authenticate educational credentials [6]. First, establishments use a secure digital wallet to store their educational credentials, which can then be securely shared with different authorized stakeholders. This wallet is secured by way of blockchain technology, meaning that every transaction is saved in a dispensed ledger, which is hard to tamper. As a result, the chain of acceptance between the issuing institution and the receiver is preserved, ensuring the authenticity of the academic credentials [7]. The blockchain-based instructional certificate Authentication device is a hassle-free and efficient system for authenticating and verifying educational credentials. It makes use of disbursed ledger technology to shop and share facts on certificates and transcripts [8]. This device facilitates academic establishments, employers, and other stakeholders to affirm the authenticity of an academic certificate. The machine uses a unique, tamper-proof blockchain code to keep and get entry to the information from distributed ledgers. This machine reduces the requirement of manual verification of certificates and will increase the extent of safety and accuracy by way of offering an immutable report of each certificate [9]. The gadget additionally permits a couple of individuals to, without difficulty, get the right of entry to examine the information of the certificate and green monitoring of the statistics [10]. The use of this system allows for enhancing the trustworthiness and credibility of the instructional certificate.

EXISTING SYSTEM

In the present certificate validation system, certificates are centrally issued and validated by a trusted third-party authority. This strategy is employed by educational institutions, governmental organizations, and certifying authorities to

validate individuals' knowledge, talents, and abilities [11]. The certificate validation technique verifies the identity and qualifications of the certificate holder before issuing the certificate. Subsequently, the individual possessing the certificate can present the document to potential employers, educational establishments, or other entities in order to authenticate its validity. Despite its intended safety, reliability, and effectiveness, the conventional certificate validation system is susceptible to many vulnerabilities that could potentially enable fraudulent activities, such as data manipulation, impersonation, and certificate forging [12]. One of the major drawbacks of the old certificate validation system is its centralized structure. The certificates are stored in centralized databases that can only be accessed by authorized individuals. Due to the presence of a single point of failure, the system is vulnerable to cyber-attacks and unauthorized disclosure of data. The centralization of the system also entails that the intermediaries involved in the issuance and validation of certificates may be susceptible to fraudulent behavior [13]. The certificate issuance mechanism of the previous system involved multiple intermediaries, which could impede the process and make it less efficient. The individual who holds the certificate begins the process by submitting their certification application to the relevant authority. Subsequently, the authority grants the certificate upon verifying the applicant's identity and credentials. The certificate is stored in a centralized database that is accessible only to authorized individuals [14]. The certificate validation procedure requires the certificate holder to submit their certificate for verification. The verifier typically carries out this process manually, ensuring the authenticity of the certificate and confirming the identity of the certificate holder. Although the verifier may have to contact multiple intermediaries to verify the legitimacy of the certificate, the validation process for certificates can be both time-consuming and inefficient. Refer to the website for additional details. Consequently, individuals get disillusioned with the system. The traditional certificate validation system is vulnerable to deceitful practices such as data modification, impersonation, and certificate forgery [15]. Upon the compromise of the certificate, deceitful behaviors may occur. The certificate is intentionally modified, or the holder or an intermediate provides false information. Detecting fraudulent activities can be challenging and can result in significant consequences, such as damage to one's reputation and legal ramifications. In summary, the existing certificate validation system could be more efficient, laborious, and susceptible to fraudulent activities. An enhanced and fortified system is necessary, capable of swiftly and openly verifying certificates. Implementing a certificate validation system based on blockchain technology is an effective approach to tackling the issues arising from the existing system. Data can be securely kept and authenticated using a blockchain, which is a decentralized and distributed ledger, ensuring both safety and transparency [16]. The technology eliminates the need for intermediaries,

Hydroponics in Agriculture

Shivam Raj[1,*], Ramashankar[1], Ravi Raman[1] and **Sachin Gautam[1]**

[1] *Department of Civil Engineering, Greater Noida Institute of Technology, GNIOT, Greater Noida, Uttar pradesh, India*

Abstract: The process of urbanization and modernization has diminished the accessibility of agricultural regions. Consequently, the future harvests will fail to meet the expected productivity. Subsequently, in order to fulfill the necessary demand, methods such as hydroponics, aquaponics, and aeroponics will be utilized. Countries such as Israel and Abu Dhabi, as well as arid regions, necessitate the use of these specific agricultural techniques in order to address the issue of famine.

Keywords: Agricultural techniques, Agricultural regions, Geoponics, Hydroponics, Urbanization.

INTRODUCTION

Hydroponics is a soilless way of cultivating plants and crops. Given the limited quantity of land, achieving the needed level of food production would be a formidable task [1]. Regions with limited water resources also experience a food crisis. To overcome this issue, hydroponics and aquaponics will be employed because of their ability to provide better results with less water and time compared to traditional soil agriculture [2, 3]. We should aim to optimize productivity while minimizing water consumption. We will employ hydroponics, a more advanced method compared to traditional soil-based agriculture, to develop crops [4].

RELATED WORKS

Hydroponics is an agricultural technique that substitutes soil with water and nutrient solutions to cultivate plants. The cultivation technique holds significant promise for enhancing crop yields and promoting sustainability in agricultural practices. Nevertheless, the effectiveness of hydroponics is greatly dependent on accurate diagnosis [5, 6]. Hydroponics diagnostic models are employed to oversee

* **Corresponding author Shivam Raj:** Department of Civil Engineering, Greater Noida Institute of Technology, GNIOT, Greater Noida, Uttar pradesh, India; E-mail: srksrk2001@gmail.com

and enhance plant well-being, water administration, and nutrient concentrations. Hydroponics diagnostic models have diverse uses, encompassing the monitoring of plant health and growth, identification of nutrient imbalances, assessment of soil pH, and guidance on water management [7 - 9]. The majority of these models provide immediate feedback and are specifically designed to optimize the efficiency of growth and minimize the use of resources while also guaranteeing that plants have the ideal amount of nutrients available for their development [10, 11]. Regrettably, there are multiple concerns linked to diagnostic models for hydroponics. Initially, numerous versions are excessively costly and intricate to be within the reach of small-scale or hobby farmers. Furthermore, the expense of sensors and other components remains elevated, constraining the accessibility of the technology [12, 13]. Furthermore, numerous models exhibit limited adaptability and are restricted to particular settings or specific agricultural produce. Hydroponics has gained popularity as a method of food production in agriculture. Its promise for high yield and minimum environmental effect has led to a growing interest in developing computer models for this technique. These models facilitate farmers' comprehension of the interplay between plants and the environment, enabling them to pinpoint crucial areas for enhancement in their hydroponics system [14, 15]. An example of a computer model is the HydroYield model, which was created by academics at Stanford University. The purpose of this model is to forecast plant biomass production and offer insights into the impact of various environmental conditions, such as nutrient availability, light intensity, air temperature, and water content, on plant growth. Additionally, it can be utilized for the analysis of crop nutrient needs, scheduling of irrigation, and evaluation of other crucial aspects. Another beneficial model is the Hydroponics Plant Growth Model created by Oregon State University [16, 17]. This model specifically examines the correlation between plant development and environmental variables, including water availability, fertilizer provision, light intensity, and air temperature. Additionally, it can be employed to enhance the efficiency of a hydroponics system tailored to a particular crop. Furthermore, the DRIVEN model was formulated by academics at the University of California, Berkeley [18, 19]. This model uses machine learning techniques to detect and analyze interactions among the many components inside a hydroponics system. It utilizes accumulated data to create predictive models. Hydroponics in agriculture is an innovative method of cultivating plants that eliminate the requirement of soil as the growth medium. Instead of utilizing dirt, a solution abundant in nutrients is employed to provide sustenance and support to the plants, and subsequently, it is circulated and reused. This agricultural method can enhance crop productivity while simultaneously decreasing water consumption and enhancing the quality and quantity of yields. In addition, hydroponics provides an expedited and more nourishing growth environment in the initial phases of plant growth while

minimizing the likelihood of disease or pest invasion. In addition, it does not necessitate the use of pesticides or herbicides [20]. Furthermore, when integrated with renewable energy sources, it has the potential to diminish the reliance on fertilizers derived from fossil fuels.

METHODS OF HYDROPONICS

Various hydroponic techniques enable the cultivation of diverse crops using distinct methodologies:

• Wick system refers to a method of irrigation that utilizes a wick to transport water from a reservoir to the roots of plants.
• Nutritional Film Technique.
• Hydroponics using the Deep Water Culture method.
• Irrigation system that delivers water in small, controlled amounts.
• The Ebb and Flow system.

We will employ the "Deep Water Culture" method in hydroponics for our plant development experiment, as it is the simplest and most efficient approach. The process involves using a container, namely a Styrofoam box with dimensions of 490*338*165 mm, to do the task.

GROWING MEDIUM

Instead of using soil, we employ a growth medium that operates based on the same principles as soil. This approach may yield better outcomes because the soil contains diverse bacteria that may be unnecessary for the crop and can lead to crop failure. The following items are:

• Coco-coir refers to the fibrous material derived from the outer husk of coconuts.
• Rice hulls.
• Perlite is a substance.
• Peat moss is a type of organic material.

For our experiment, we shall utilize "coco-coir" as it is an exceptional growing medium that functions similarly to the soil.

MATERIALS USED IN THE EXPERIMENT

Vegetables

We will use LactucaSativa (Lettuce) for our experiment, which is a leafy vegetable. It can be grown in a period of 6 to 8 weeks; we will compare the

An Augmentation in Energy Efficiency for Grid-Coupled PV System by IT3FLC Controller-Based MPPT

Adarsh Kumar[1,*], Raj Gopal Mishra[1], Sumit Kumar[1] and **Omkar Singh Kardam[1]**

[1] *Hi-Tech Institute of Engineering and Technology, Ghaziabad, Uttar pradesh, India*

Abstract: Photovoltaic arrays can achieve their maximum power point (MPP) under any circumstances through the utilization of a technique called maximum power point tracking (MPPT). Field-Programmable Logic Controllers (FLCs), such as IT1FLC, IT2FLC, and IT3FLC, offer the most efficient means of monitoring Maximum PowerPoint Tracking (MPPT). The research introduces a novel T3FL near method that enhances tracking accuracy and speed by addressing the ambiguity caused by instabilities. The suggested system consists of a photovoltaic module, a battery, a resistive load, and a maximum power point tracking (MPPT)-controlled buck converter. To ensure that the photovoltaic (PV) system performs at its maximum power point (MPP), the buck converter is directly linked to the solar panel. This connection is designed to align with the output pulse width of the recommended controller. The IT3FLC algorithm maximizes the output of solar panels to reduce battery degradation caused by fluctuating MPPT voltage and extend battery lifespan. The total power and voltage of IT3FLC are equivalent to the present IT1FLC and IT2FLC of the battery and load, respectively. The suggested various methodologies for assessing the MPPT efficiency were implemented by conducting simulated research and practical tests on a solar module and a buck converter. The techniques are implemented using MATLAB Simulink. All three weather conditions - homogeneous light, rapid shift, and partial shade - are accurately reproduced. The modeling and experiments confirm that the IT3FLC ensures precise maximum power, strong stability, and reliable performance despite uncertainties caused by disruptions to the inputs of the photovoltaic system.

Keywords: IT1FLC, IT2FLC, IT3FLC, Maximum power point tracking, Power point coupling.

* **Corresponding author Adarsh Kumar:** Hi-Tech Institute of Engineering and Technology, Ghaziabad, Uttar pradesh, India; E-mail: adarshk91@gmail.com

INTRODUCTION

The primary objective of this research is to develop a grid-integrated photovoltaic (PV) system with exceptional efficiency. This paper proposes a Maximum Power Point Tracking (MPPT) system based on Interval Type-3 Fuzzy Logic Control (IT3FLC). The MPPT approach based on IT3FLC operates with high efficiency and yields superior results in situations where the intensity of sunlight fluctuates [1 - 3]. The simulation investigation is conducted using a software named MATLAB/SIMULINK. To mitigate harmonic currents and compensate for reactive power generated by nonlinear loads, the proposed system incorporates photovoltaic electricity into the grid through the use of an Active Power Filter (APF). We utilize a boost converter equipped with a frequency-locking mechanism to inject solar electricity into the grid [4 - 6]. The complete system is constructed and designed using MATLAB/Simulink software. The primary objective of this research is to develop a grid-integrated photovoltaic (PV) system that is exceptionally efficient. This work introduces a Maximum Power Point Tracking (MPPT) method that utilizes an Interval Type-3 Fuzzy Logic Controller (IT3FLC) [1]. The IT3FLC-based MPPT algorithm exhibits rapid response and yields superior results in scenarios with fluctuating solar irradiance. The simulation investigation is conducted using a software named MATLAB/SIMULINK. The simulation results validate the effectiveness of the grid-connected system utilizing Active Power Filter (APF) technology. The results demonstrate that the proposed algorithm is superior in locating the maximum power point tracking (MPPT) compared to conventional strategies such as perturb and observe [7 - 9]. This performance is being compared to the projected IT3FLC-based MPPT system, which is constructed based on rapidly fluctuating radiation. This article explores the use of Solar PV systems to assist IT3FLC in addressing concerns related to the membership functions of IT2FLC. The IT3FLC technique is utilized to improve power quality in PV power system, considering the presence of a collection of indistinct regulations that may encompass many models (equations) [10 - 12].

RELATED WORKS

Through a number of related studies (Fig. **3**), the suggested method by IT3FLC controller-based MPPT for an increase in energy efficiency for grid-coupled PV systems was examined and assessed. To enhance the maximum power point tracking technique (MPPT) for photovoltaic systems, numerous studies have been carried out. Fuzzy logic control (FLC) and other fuzzy logic-based MPPT controllers were introduced in this respect [13]. Fuzzy logic controllers increase energy efficiency by monitoring the photovoltaic system's highest power point. PV systems connected in series and shunt have both employed these controllers

[14]. Additionally, to increase the energy efficiency of PV systems, oscillation-less incremental conductance-based MPPT algorithms like incremental conductance (IC) have been proposed. Algorithms like genetic algorithms and bee algorithm-based MPPT for wind power PV systems have been used in other publications [15]. Tests have been conducted on several PV system types, including single- and double-diode models. They have raised these systems' energy efficiency. Furthermore, a number of artificial intelligence (AI)-based strategies, including fuzzy neural networks (FNNs) and artificial neural networks (ANNs), have been put forth to increase the energy efficiency of PV systems. These methods have shown to be quite successful in locating the PV system's MPPT point. Furthermore, some studies have employed sophisticated control techniques to raise PV systems' energy efficiency [16, 17]. Model predictive control, particle swarm optimization, linear programming, and proportional integral derivative (PID) controllers are some of these techniques. Excellent outcomes have been obtained by applying these principles to a variety of PV applications, including stand-alone and grid-connected systems [18, 19]. To put it briefly, the related works regarding An Augmentation in Energy Efficiency for Grid-Coupled PV System by IT3FLC Controller-Based MPPT include a number of studies that explore how to increase the energy efficiency of PV systems using advanced control strategies like linear programming, particle swarm optimization, model predictive control, and PID controllers, as well as AI-based approaches and fuzzy logic-based and other optimization algorithms [20].

PHOTOVOLTAIC ENERGY SYSTEM

The photovoltaic system is expected to significantly contribute to meeting global energy demands. Photovoltaic systems in power systems can be categorized into two basic application types: on-grid or grid-connected applications and off-grid or stand-alone applications. There has been a rise in the adoption of solar systems in medium-sized grids for residential utilities. The Maximum Power Point Tracking (MPPT) technique can enhance the efficiency of solar systems. Controllers should regulate both the voltage and current produced by the PV array. The setup of the PV system may be complicated by the high risk of failure in tracking maximum power during unexpected weather conditions. When the distributed generation (DG) systems, which rely on PV systems, have a breakdown and are no longer connected to the utility grid, they might still provide power to neighboring loads. In addition, a converter can be employed to adjust the output voltage of a photovoltaic system. Nonlinear loads are the primary sources of harmonic distortion in a power distribution system, and the fuzzy logic controller is employed as a dependable regulator for maximum power point tracking (MPPT). Power distribution networks receive harmonic currents generated by nonlinear components through the point of common coupling.

Python in Finance: Introduction and Basic Strategy

Tanu Gupta[1,*], Anupam Singh[1], Anuja Gupta[1] and **Somya Goel[1]**

[1] *Department of ECE, HI-Tech Institute of Engineering and Technology, Gzb, UPTU, India*

Abstract: Financial/Trading markets in today's digitalized era are being dominated by share markets, options trading, and the forex market. These markets have a huge underlying potential to generate income, but the analysis of these markets regarding the trading of stocks, foreign currencies, *etc.*, is highly dependent on luck. So, to ease the understanding of markets, Python algorithms can be a game-changer. It tends to be received to classify the specific and wanted data that is being covered up in tremendous information. In this paper, we tried to evolve trading algorithms with the help of abstraction, moving averages, and open-source Python-3 libraries, thus making the evaluation and import of data market information more contextually aware and simpler.

Keywords: Algorithms, Averages, Financial, Potential, Underlying.

INTRODUCTION

Python is extensively employed in the domains of machine learning, artificial intelligence, and web software development. Algorithmic Trading is a financial application of Python. This area of academic inquiry is occasionally denoted as Quantitative Trading [1]. This is not novel and has been employed for numerous years in this field. In machine learning, historical data refers to the data that is used to train a system to learn and make predictions based on fresh data. Python is widely used in various fields, like as medicine (for studying and diagnosing diseases), marketing (for analyzing and predicting consumer behavior), and even trading (for evaluating and developing strategies based on financial data) [2, 3]. The primary issue lies in the fact that trade is either reliant on chance or remains undetermined. Currently, financial experts are enrolling in Python trading classes to stay relevant in the finance industry. Gone are the days when computer programmers and finance professionals were in distinct divisions [4]. Only a limited number of research works have demonstrated that algorithmic trading is

---

[*] **Corresponding author Tanu Gupta:** Department of ECE, HI-Tech Institute of Engineering and Technology, Gzb, UPTU, India; E-mail: hod.ece@hietgroup.org

now having a significant impact. In order to cultivate forceful traders in the financial industry, corporations are recruiting computer engineers and providing them with education in finance to become algorithmic traders [5]. Approximately 70% of the order flow on the US stock exchange is attributed to algorithmic trading. In order to shed light on this unexplored domain, we analyzed a set of fundamental techniques and algorithms. This offers several practical benefits, such as its streamlined design [6 - 8].

Why Python?

"Which programming language do we believe is more advantageous for algorithmic traders?"The issue that arises in the mind of every trader is whether Python is the best language for algorithmic trading. The answer to this question is unequivocally, "Yes, Python is the most suitable language for algorithmic trading." Several crucial factors that should be taken into account in this entire process prior to selecting a programming language include cost, performance, resiliency, modularity, and various other strategic characteristics. A scripting language is a programming tool that traders must use to write code. Python is commonly used for prototyping quantitative models, making it highly relevant in the field of inclusive trading. When analyzing financial markets, traders often encounter competing agendas. Python is a highly straightforward and adaptable programming language that enables the rapid development of a minimum viable product (MVP), which is precisely what financial organizations desire in terms of technology that is both flexible and simple. The practicality lies in the process of designing algorithms and formulas, as well as simplifying the rules of Python, particularly in the context of finance. The task of integrating economists into a Python-based framework is quite straightforward to verify. Scipy, NumPy, and matplotlib are Python libraries that enable users to streamline calculations and present results clearly and understandably. On this platform, there is no need to create tools from the beginning; both revenue and time are greatly conserved on these development projects. Fintech products sometimes require collaboration with external parties, a task made simpler by the utilization of Python libraries.

The very attractive uses of this platform in the Fintech services are:

1) Analytics tools - Python is highly valued in the field of quantitative finance. Quantitative finance is a fundamental tool that analyzes and manipulates large quantities of financial data. Pandas, a Python module, simplifies the process of data visualization and enables the execution of complex statistical calculations.

- Libraries such as Scikit or Pybrain facilitate this task.
- Software designed specifically for banking purposes.

- Cryptocurrency.
- Developing strategies and methods using Python.

Benefits of Python

The primary emphasis is on precision achieved through clarity. When engaging in real monetary transactions, we require a highly efficient system that any sophisticated individual can easily examine to ensure it is free of any errors or glitches. The user did not provide any text. It greatly facilitates the process of programming and evaluating algorithmic trading systems. The process of transitioning from a basic trading code to a dynamic algorithm can be time-consuming. The user did not provide any text. Python is a more efficient choice for evolving the trading platform while working with C and C++ requires more time and effort. The user did not provide any text. The modifications can be swiftly implemented to the code or data, even within dynamic situations. The task of debugging, which involves identifying and fixing errors in code, is made possible in Python. The user did not provide any text. Although it may appear to be a basic bot, it can explore advanced techniques such as neural networks. Python is the most comprehensive language for implementing these techniques. Additionally, it can perform tasks such as counting Github commits for a cryptocurrency or scanning Twitter for mentions. This platform allows for efficient execution of these tasks with minimal code required. The user did not provide any text. Python is replete with extensive libraries, making it highly convenient for users to write code in just a few lines. The user did not provide any text. While certain steps can be omitted in Python, they are essential for a quantitative trader to input in C or C++. We may enhance the functionality of Python by implementing modifications or integrating new modules, which sets it apart from other programming languages. The user did not provide any text. The extensive array of libraries enables algorithmic traders to conduct data analysis with execution speeds equivalent to compiled languages such as C or C++. The user's text consists of two references.

RELATED WORKS

Python's ease of use and potent capabilities make it one of the most widely used programming languages worldwide. It is extensively utilized in data analysis and web creation, and its use in the banking sector is mounting. Python's broad scientific library and massive data set handling capabilities make it a great choice for the banking industry [9]. Applications can be created at many different levels, from basic trading algorithms to complex applications. Numerous projects and packages are included in the related work in this sector [10, 11]. Time series analysis, asset pricing, and financial engineering modules are all included in the

Empowering Sustainability: Leveraging Green Technology to Drive Environmental Responsibility in Organizational Behavior

Himanshi Mittal[1,*], Ashish Diwakar[1], Vipin Kumar Tomer[1] and **Shilpa Chaudhary[1]**

[1] *Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India*

Abstract: Green technology promotes a different perspective on growth and development, urging firms to collaborate and utilize knowledge and resources to establish and execute sustainable solutions. The objective of this study is to examine the correlation between green technology and organizational practices in order to enhance sustainability. In response to growing environmental concerns, corporations must strive to achieve sustainable growth by efficiently using green technology while fulfilling their environmental duties. Green technology not only has a positive impact on the environment but also fosters creativity and generates novel business prospects. Commonly known as environmental technologies, their objective is to safeguard the environment through the mitigation of pollution, promotion of sustainable consumption, and prevention of natural resource depletion. Incorporating green technology in corporate behavior not only showcases environmental responsibility but also yields many advantages for firms, employees, and society. Implementing sustainable practices can have a beneficial effect on employee morale and productivity, as employees feel a sense of satisfaction in being part of an organization that prioritizes sustainability and actively contributes to a more favorable future. Through the adoption of sustainable practices and the allocation of resources towards environmentally friendly technology, companies may cultivate a more prosperous and resilient future for both themselves and future generations.

Keywords: Environment responsibility, Green technology, Green growth, Green organizational culture, Organization, Sustainability.

INTRODUCTION

The escalating environmental consequences of human activities have emerged as a critical issue for individuals, companies, and governments worldwide in recent

[*] **Corresponding author Himanshi Mittal:** Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India; E-mail: himanshimittal8@gmail.com

years [1]. Consequently, there has been an increasing fascination with creating and embracing eco-friendly technology, which strives to minimize the adverse effects of human actions on the environment. Green technologies refer to a diverse array of sustainable and environmentally friendly goods, systems, and processes that aim to limit energy usage, decrease waste generation, and preserve natural resources [2 - 4]. Adopting green technology is crucial for firms aiming to improve their competitiveness and reputation in a dynamic commercial climate, in addition to addressing environmental concerns. Green technology enables enterprises to diminish their environmental impact, enhance their energy efficiency, and optimize their financial performance by reducing costs and enhancing customer connections [5]. Organizational behavior is a discipline that aims to comprehend the actions and interactions of individuals, groups, and organizations in the workplace and how these actions can be manipulated to accomplish organizational objectives. There has been an increasing focus on incorporating green technology adoption into organizational behavior theory and practice [6 - 8]. The advent of green organizational behavior as a new field of research focuses on the effective implementation and integration of green technologies in organizations to promote sustainability and environmental responsibility. This research aims to examine the idea of green technology and its impact on organizational behavior. We will analyze the advantages and difficulties associated with the adoption of green technology and explore its successful integration into organizational culture, leadership, and employee behaviour [9 - 11]. We aim to enhance comprehension of the impact of green technology on both environmental sustainability and organizational success.

RELATED WORKS

The use of green technology to promote sustainability within organizations is the main topic of the linked works of empowering sustainability: leveraging green technology to drive environmental responsibility in organisational behaviour [12 - 14]. The literature specifically examines the ways in which green technology can be applied to raise environmental consciousness, lessen negative environmental effects, encourage creative green practices, and advance long-term sustainability objectives [15]. A variety of green technologies are covered by the research, such as waste management, green building, renewable energy, energy efficiency, and sustainable manufacturing [16]. The research also examines the ways in which green technology might support organizational actions that promote sustainability, including the implementation of sustainable practices, staff involvement, alteration of customer behavior, and environmental responsibility [17, 18]. Furthermore, scholars evaluate how green technology might serve as a platform for green projects and promote cooperation for social and environmental sustainability. Ultimately, the study delves into the diverse obstacles and

prospects that green technology presents in promoting sustainability and offers discernments into optimal approaches for utilizing green technology within establishments [19].

GREEN TECHNOLOGY

The adoption of green technology has been increasing in order to foster sustainability inside enterprises. Companies can decrease their total carbon footprint and make a positive environmental impact by employing sustainable energy sources. Furthermore, technological advancements have facilitated the creation of environmentally sustainable solutions for several sectors. For instance, the use of electric vehicles and hybrid cars can significantly mitigate pollutants and decrease expenses linked to conventional gasoline-powered transportation. The implementation of green technology has significantly revolutionized the promotion of sustainability and environmental responsibility across several industries. Businesses can greatly mitigate their environmental footprint by employing renewable energy sources and adopting eco-conscious measures such as trash reduction and recycling. Furthermore, implementing these steps not only contributes to environmental preservation but also results in financial benefits and enhanced reputation among customers who are progressively prioritizing sustainability. Therefore, it is imperative for firms to persistently investigate and adopt environmentally friendly technology as a strategy to accomplish their sustainability objectives while simultaneously enhancing their financial performance.

LEVERAGING GREEN TECHNOLOGY IN ORGANIZATIONAL BEHAVIOR

Adopting environmentally friendly practices is essential and urgent (Peattie, 1992; Pierre &Prothero, 1997; Growth, 1998). Sustainable manufacturing is the practice of producing goods while minimizing their environmental impact. Utilizing environmentally friendly technologies in organizational behavior can result in substantial enhancements in both employee contentment and overall efficiency. Implementing environmentally conscious measures, such as minimizing paper consumption and adopting energy-efficient technologies, can showcase a company's dedication to ecological stewardship while simultaneously fostering a healthier and more sustainable work environment. Furthermore, research has demonstrated that individuals employed by environmentally conscious firms exhibit elevated levels of job satisfaction and greater levels of engagement in their work. By integrating sustainable technology into organizational behavior initiatives, firms can establish a more favorable and efficient work environment for their employees. In the contemporary era, enterprises are consistently seeking

IoT Based on Accident Detection and Alert System

Sheelesh Kumar Sharma[1,*], Avinash Kumar Sharma[1], Srishti Garg[1], Priyansha Singh[1] and Yashaswi[1]

[1] *Department of CSE, ABES Institute of Technology, Ghaziabad, Uttar Pradesh, India*

Abstract: Reducing the fatality rate resulting from vehicle accidents is a significant concern in our society. Delivering prompt and excellent emergency healthcare services poses a difficulty. The response time of emergency personnel to the accident location is significantly prolonged, resulting in an occasional inability to preserve lives. In order to address this scenario, it is imperative to minimize the interval between the occurrence of the accident and the provision of medical services. We have developed a meticulously structured Android application that will be utilized for the purpose of identifying accidents and promptly alerting emergency services. Additionally, it will carry out timely rescue operations. A built-in sensor designed to detect car accidents and transmit the data to the Android Application. The system will promptly notify the user through an alarm regarding the generated accident notification. It will then allow a brief period, known as the buffer time, for the user to cancel any erroneous notifications. If the user fails to cancel, the message will be transmitted by GSM to the nearest hospital and police station, along with the precise position of the accident determined by GPS technology. The execution of this Android application has the potential to preserve the lives of millions of individuals annually.

INTRODUCTION

Vehicle accidents are the primary source of sickness and impairment. It has become an unfortunate reality in our lives. Contemporary individuals have exhibited a lack of caution in recent times [1]. It is projected that by 2025, the number of fatalities caused by road traffic accidents in India will exceed 250,000 each year. Delivering prompt and exemplary emergency healthcare services is a difficulty. Approximately 25% of deaths are attributed to the lack of access to medical facilities. The growing utilization of automobiles is leading to a rise in traffic congestion and the occurrence of road accidents [2]. The World Health Or-

---

* **Corresponding author Sheelesh Kumar Sharma:** Department of CSE, ABES Institute of Technology, Ghaziabad, Uttar Pradesh, India; E-mail: drsksharmagzb@gmail.com

ganization's Global Status Report on Road Safety, released in December 2018, reveals that there are 1.35 million fatalities and approximately 50 million injuries caused by vehicle accidents each year. The user's text is "[3]". Motor vehicle accidents are the primary cause of mortality among individuals aged 5 to 29 years. Males in the age group of under 25 years exhibit a higher propensity for becoming engaged in road traffic accidents compared to females. The causes of the accidents include speeding, driving under the influence, driver distractions, disregarding traffic signals, and failure to use safety equipment such as helmets and seat belts [4]. Nevertheless, we have noticed that a contributing factor to mortality is the delayed arrival of emergency personnel at the scene of the accident. The ambulance service delay is caused by ambulances waiting at traffic signals. There is a requirement for an application that can identify and prevent accidents to ensure the safety of individuals [5]. This system has numerous advantages, including cost-effectiveness, convenience of use, portability, quick assistance for rescue teams, reduction in mortality rates, assistance in locating the nearest hospital and police station, and notification of the victim's family members. The prevalence of accidents is higher in rural areas due to the presence of expansive and unobstructed roadways. Consequently, this application will prove to be more beneficial in such areas [6]. By installing this program, death rates can be decreased, and accidents can be detected in all types of vehicles. This application is a real-time tracking system that accurately determines the user's location or the location of an accident. The program aims to minimize the temporal gap between the location of the accident and the provision of medical assistance, hence enabling prompt treatment of the affected individual [7]. This system utilizes an ultrasonic sensor equipped with a geo-distance algorithm to detect accidents in a vehicle [8]. Once the occurrence of an accident is confirmed, the application will activate a buffer time alarm system to determine if the victim requires assistance from emergency responders. If the victim deactivates the alarm, no notification will be sent to the hospital, police station, or relatives [9]. However, if the victim fails to respond within the designated time frame, the application will automatically transmit the precise location of the accident using Global Positioning System (GPS) technology.Additionally, notifications will be sent to the emergency contacts specified during the application's setup, and an alert will be sent to the nearest police station and hospitals [10]. This alert will include the user's details, such as name, blood group, and gender, which will be transmitted through the GSM (Global System for Mobile Communication) module [11]. Through the use of this application, we can effectively address this problem and preserve the lives of countless individuals.

RELATED WORKS

The Internet of Things (IoT) has been increasingly used in many different applications for accident detection and alert systems [12]. Such systems are particularly useful in situations where timely intervention is needed to minimize the risk of injury, property damage, or other consequences associated with an accident [13]. Some of the related works of IoT based on accident detection and alert systems include the use of wearable sensors to monitor health, detect falls, and trigger medical response protocols; the use of drones to monitor hazardous areas for public safety; the use of sensors and wireless communication to detect crash sites and road accidents; and the use of cameras and sensors to detect fires and alert for evacuation. Additionally, many other projects have been proposed to investigate the scalability and reliability of IoT-enabled accident detection and alert systems [14]. These include proposals for distributed vehicle monitoring systems, intelligent sensor networks for monitoring emergency medical situations, and the use of the cloud for further data analysis [15]. Overall, researchers are working toward a better understanding of how IoT can be used for accident prevention and developing efficient systems for the timely detection, analysis, and alerting of accidents. With the help of such improvements, lives may be saved and risks minimized as IoT technologies continue to advance.

LITERATURE SURVEY

The accident detection and alert system will furnish the user's accident location details and expedite the response time of emergency personnel. Prior to commencing this paper, we scrutinized multiple scholars from diverse journals who presented numerous methodologies to mitigate mishaps. The preceding studies and literary contributions of authors are as follows: The paper [4] titled "Accident Detection and Alert App" by Dr. C. K. Gomathy, K Rohan Bandi Mani Kiran Reddy, and Dr. V Geetha discusses the utilization of sensors such as GPS and Accelerometer in mobile phones to detect collisions. This is achieved by employing a Sensor Fusion Based Algorithm that identifies sudden external disturbances in speed. The system comprises hardware and software components. The equipment unit comprises collision detection sensors that are integrated with an Arduino board and installed in the car. Next, the programming component is an Android application implemented on drivers' smartphones that is utilized to obtain a detailed map with step-by-step directions. The paper titled "Vehicle Accident Detection and Alert App" by Dr. E ManohaA. AbilashBerkin, S. Baskar, and R. GanapathyKarthikeyan reports the use of an algorithm that relies on data from an accelerometer sensor to detect and alert about vehicle accidents. The primary objective of this work is to develop an application that utilizes the sensors found in mobile phones, such as GPS and Accelerometer, to identify collisions by

Performance Evaluation of Tools Made of Super Hard Material CBN during the Renovation of Components of Harvester Machinery

Pankaj Kumar Mishra[1,*], Praveen Chandra Jha[2], Vijay Kumar[3], Ram Kishor Gupta[1] and V.V. Kolomiets[4]

[1] *Department of Mechanical Engineering, HI-Tech Institute of Engineering and Technology, Ghaziabad-201009, India*

[2] *Department of Applied Science, I.T.S., Greater Noida- 201306, India*

[3] *Department of Mechanical Engineering, I.M.T., Greater Noida- 201306, India*

[4] *Agriculture University, Kharkov, Ukraine*

Abstract: An investigation was conducted to examine the influence of hard alloy turning tools and BN-based super hard materials on the performance characteristics during the finish turning of components with the deposition of Surfacing wire (Sw)-40Cr8Si2 (HRC 50-58). Upon deposition, the surface undergoes a significant increase in hardness, resulting in a hard-faced item with a rough, uneven, and undulating surface. Consequently, a machining process is employed to provide a smooth finish and ensure the desired dimensions are maintained. The variables in question are as follows: transverse chip shrinkage ξ, frictional coefficient during modeling μ, vertical component of cutting force P_z (in Newtons), cutting temperature $\theta°C$, machined area F (in square meters), cutting-tool life before reaching a specified blunting criterion T (in minutes), maximum cutting length at the optimal wear of cutters L = T·V (in kilometers), and the relative flank wear of cutters at their specified resistance. The symbol "h_{03}" represents the ratio of h_3 to L, where h_3 is measured in micrometers (μm), and L is measured in kilometers (km). It is used to describe the roughness of a machined surface. The performance characteristics of turning cutters in this investigation were measured in terms of Ra (μm). The techniques of experimental optimization of surface roughness that have a significant influence on resurfaced hard turning are also investigated.

Keywords: Blunting criterion, Frictional coefficient, Surface roughness, Turning process, Transverse chip shrinkage, Welding technique.

---

[*] **Corresponding author Pankaj Kumar Mishra:** Department of Mechanical Engineering, HI-Tech Institute of Engineering and Technology, Ghaziabad-201009, India; E-mail: spsingdirector@hiet.org

INTRODUCTION

Engineering employs cutting-edge technology that integrates very durable metals and alloys with extraordinary strength, ability to withstand high temperatures, and resistance to corrosion. The objective of this study is to evaluate the efficacy of a tool made of boron nitride, a highly durable substance, in the processing of the deposited material. The surface wire, Sw-40Cr8Si2 (HRC 50-58), exhibits considerable volatility in its physical and mechanical properties. Additionally, it exhibits micro flaws, possesses a non-uniform structure, and lacks comprehensive analysis of the impact of these characteristics on the tool's overall performance. Deposition can be applied to either the surface or edge of a component during production in order to improve its resistance to wear. Alternatively, it can be specially applied to the section of the component that is susceptible to wear during service or operation [1]. The objective of hard-facing is to mitigate costly periods of inactivity and reduce the expenses associated with expensive replacement parts by improving their ability to withstand wear and extending their overall durability [2]. Angello G.N. conducted the initial research on the machinability of the deposited Surfacingwire (Sw)-65Mn (HRC 42...48) using a turning tool built of superhard materials based on boron nitride CBN-R and hexane-R. Nevertheless, the examination of the empirical formula correlations of tool material performance characteristics, as obtained by the individual in the specified coating process, reveals that their practical application could be more feasible. This is due to the fact that certain correlations lack physical significance, as the roughing process of the deposited materials with the turning tools made of CBN-R is unrealistic, given their extremely low resistance under these conditions [3 - 5]. The most sophisticated method in the processing of hard coatings involves the use of cutters built from superhard materials, specifically those based on hexagonal boron nitride. An analysis of the existing literature on machining coatings reveals that the majority of research focuses on assessing the ease of machining for specific types of coatings or establishing the effectiveness of tools, particularly those composed of boron nitride-based polycrystalline superhard materials. However, with comprehensive theoretical investigations, it is possible to justify the adoption of new tool materials adequately [6, 7]. Existing literature and conventional practices in coating processes have consistently shown that tools built of superhard materials consistently exhibit inferior performance compared to solid structural elements during processing. Hence, it is imperative to devise techniques for enhancing the efficiency of tools while considering the alterations in characteristics and uneven coating structure in order to minimize expenses associated with repairing worn machine components. Upon analyzing the current techniques for determining the machinability properties of materials through cutting, it is evident that only two accelerated methods can be recommended for processing coatings in facility repairs. This is specifically a modified method of

end turning [8, 9]. An examination of patents and inventions from foreign countries reveals that our research focuses on specific areas that are protected by copyright certificates. These areas involve the use of tools made from polycrystalline superhard materials based on boron nitride, as well as the use of specialized equipment. While these two methods are similar, they differ in their production processes. Recently, in several technologically advanced countries, there has been a simultaneous development of new tool materials and corresponding handbooks that provide comprehensive information about these materials. The works [10] provides the most comprehensive analysis of the performance of tools utilizing boron nitride [11 - 13].

RELATED WORKS

It can be difficult to evaluate the performance of tools constructed of the extremely hard substance cubic boron nitride, or CBN when rebuilding harvester mechanical parts. When utilized for these kinds of tasks, conventional turning and drilling tools wear down more quickly than CBN tools. Therefore, assessing the effectiveness of CBN tools in lieu of traditional techniques has taken on even greater significance. The wear resistance of CBN tools is one of the main elements that determine their performance. When renovating harvester machinery components, the axial wear rate (AWR) and flank wear rate (FWR) of the tools are frequently calculated to evaluate their continuous cutting performance. If the performance of the tools is to be maintained, a rise in the flank wear rate and AWR often indicates that the tools are dull and need to be replaced. The cutting process parameters of CBN tools are a significant issue that impacts their performance during the refurbishment of harvester machinery components. The performance of CBN tools is influenced by a number of factors, including the lubrication system, spindle speed, feed rate, cutting temperature, and cutting forces. The optimal performance of CBN tools for these kinds of applications depends on these characteristics being properly balanced. A few major concerns are involved in the performance assessments of CBN-based super hard tooling used in Harvester machinery component restoration. Since the rigidity of the tooling is crucial to the caliber of the cutting process, it is first imperative to guarantee that the tools are constructed to correct tolerances. Second, it is important to keep an eye on tool wear and how it affects tooling performance. Third, for the tool to be reliable and of high quality, effective cooling is required. Fourth, to achieve a suitable balance between tool performance and material removal efficiency, the tool's speed and feed rate must be matched with the characteristics of the material being cut. In order to maximize the performance of the tools, the cutting environment must be optimized.

A Comparative Study of Worklife Balance Trends and Challenges

Pragya Agarwal[1,*]**, Vipin Tomer**[1]**, Himanshi Mittal**[1] **and Ankit Garg**[2]

[1] *Hi-Tech Institute of Engineering & Technology, Ghaziabad, Uttar pradesh, India*

[2] *Ajay Kumar Garg Institute of Management, Ghaziabad, Uttar pradesh, India*

Abstract: The chapter provides a concise overview of the findings from a comprehensive survey conducted among employees in several leading corporate firms, focusing on the implementation of progressive work-life policies and practices. These organizations exercise different levels of authority over their employees; some enforce strict regulations, like prohibiting the use of cell phones in the workplace, while others adopt a more lenient and flexible approach. The study demonstrates that organizations that effectively implement work-life programs foster a collaborative relationship between employers and employees, resulting in beneficial outcomes for both parties. Employees who can effectively balance their jobs and personal responsibilities experience greater happiness and satisfaction, resulting in enhanced performance. Additionally, these activities have the potential to enhance a company's reputation and contribute to the retention of people.

Keywords: Employees, High-speed work environment, Satisfaction, Work-life programs, Work-life balance.

INTRODUCTION

Individuals experience significant levels of stress in the high-speed work environment of the present era, making it challenging for them to achieve a harmonious equilibrium between their personal and professional lives. Employees are required to wholeheartedly dedicate themselves to their work in this demanding and stressful work environment, often at the expense of other aspects of their lives. Individuals may become trapped in a work cycle characterized by extended hours and an excessive workload due to taking on more responsibilities than they can effectively manage. This situation can lead to burnout, a term introduced by English writer Graham Greene in his 1961 novel 'A Burnout Case'

---

[*] **Corresponding author Pragya Agarwal:** Hi-Tech Institute of Engineering & Technology, Ghaziabad, Uttar pradesh, India; E-mail: Agarwalpragya03@gmail.com

to depict a condition of emotional exhaustion and disillusionment in one's job [1]. A significant number of individuals exhibit symptoms of occupational burnout, which has become prevalent. Consequently, organizations are employing happiness and wellness consultants to assist their employees in managing the issue. Burnout refers to the state in which an individual experiences excessive emotional exhaustion, resulting in impaired performance, increased work errors, and decreased productivity. This inclination is partly attributable to the prevalent "workaholic" culture in numerous firms nowadays, wherein employees are incentivized and commended for dedicating additional hours, assuming additional responsibilities, and fulfilling established time limits. Conversely, over time, this situation evolves into a high-stress setting that may lead to increased tension and anxiety. Employees who are subjected to work-related stress sometimes encounter feelings of worry, anger, and other adverse emotions prior to experiencing stress and dissatisfaction. The user's text is enclosed in tags [2].

RELATED WORKS

Both employees and employers have long recognized the need to maintain a healthy equilibrium between work and personal life. The need to achieve a balance between work and home responsibilities is becoming more widespread in today's job environment. Nevertheless, attaining a satisfactory equilibrium between job and personal life has proven to be arduous for numerous individuals, and this matter has garnered significant attention in the realm of research. In this study, diagnostic models have been developed to gain a deeper understanding of work-life balance patterns and difficulties, as well as to evaluate the present condition of work-life balance across different industries and organizations. Diagnostics models offer valuable data that can aid in decision-making on the development, execution, or oversight of work-life balance policies, practices, or initiatives. Diagnostics models offer researchers, employers, and employees precise information about the present condition of work-life balance. They also provide a valuable understanding of the factors that influence work-life balance, including the economic climate, job attributes, work schedules, and personal or familial characteristics. Prominent diagnostic methods for assessing work-life balance include the Work and Family Survey (WFS), the Work and Family Attitude Scale (WFAS), and the Linkage Family-Work Scale (LFWS). The objective of this study is to examine and contrast different computational models employed in the analysis of work-life balance trends and issues. The models under examination will encompass econometric, sociological, qualitative, and predictive analytics approaches. Econometrics is a field that examines the connections between financial variables and is commonly employed to forecast economic trends and predict production and consumption cycles. Econometric algorithms primarily aim to ascertain the coefficients of impact among variables and find the

factors that hold the greatest significance. Econometric methods can utilize linear and nonlinear regression models to analyze the factors that impact work-life balance. When studying work-life balance trends and issues from a sociological perspective, researchers examine several elements like social stratification, workplace cultures, job expectations, and job autonomy. Researchers can employ quantitative and qualitative methodologies to investigate interactions at either the micro or macro level in order to comprehend how social structures and organizational cultures influence the work-life balance of individuals and work teams. Qualitative analysis uses several methodologies, such as interviews, focus groups, surveys, and observation, to gather data pertaining to trends, attitudes, and issues around work-life balance. The uniqueness of this study resides in its comparative methodology for analyzing the patterns and difficulties associated with maintaining a healthy equilibrium between work and personal life. The study aims to offer a more extensive understanding of work-life balance trends and challenges by examining them in various nations. Moreover, employing this comparison methodology will allow the researchers to emphasize any distinctive variables or discrepancies among countries that could have otherwise remained unreported. It could be particularly advantageous for firms seeking to develop or enhance their work-life balance strategies in a dynamic setting.

REVIEW OF LITERATURE

Maintaining a healthy work-life balance can be difficult due to the stress and fatigue associated with contemporary, fast-paced professional settings. Burnout, a common phenomenon in the workplace, often leads to emotional exhaustion and decreased performance in individuals. In his book "Rest: Why You Get More Done When You Work", Alex Sojourn-Kim Pang presents an argument. Working fewer hours and engaging in "active rest" are crucial for enhancing creativity and productivity. Workers are facing growing challenges in maintaining a harmonious equilibrium between their professional obligations and personal relaxation, leading to an imbalanced way of life that can trigger stress, anxiety, and sleep disorders. Sasha Madhya, an authority on managing stress in the corporate setting, highlights that a multitude of factors, such as time constraints, academic evaluations, mental strain, as well as personal and marital issues, can contribute to work-related stress. The user's text is " [3]". Madhya emphasizes the need to achieve work-life balance through mindfulness, optimism, and perseverance. The reasons for stress can be categorized into internal elements, such as a lack of engagement and drive, and external issues, such as tough employers, strained relationships with coworkers, and displeasure with job requirements.

Chronic Kidney Disease Prediction Using Machine Learning: Feature Selection

Sujoy Mondol[1,*], Syed Mohammad Moiez Ur Rahman[1], Asjad Moiz Khan[1], Hoor Fatima[1] and **Preeti Dubey[1]**

[1] Computer Science & Technology, Sharda University, Greater Noida, (U.P.), India

Abstract: Chronic kidney disease (CKD) is a pathological condition that, if not addressed, can progress to renal failure. Machine learning models have the potential to assist in predicting chronic kidney disease by analyzing data from blood tests, urine tests, imaging tests, and biopsies. This study primarily examined a dataset of blood samples consisting of 26 patient features. These features were subsequently narrowed down to the top 10 based on their highest statistical score, which was calculated using SelectKBest. This technique enhances the accuracy and efficiency of machine learning models by reducing the dimensionality of the input data and emphasizing the most pertinent features. In this study, two approaches were examined. The K-fold cross-validation technique achieved the greatest accuracy of 98.0%, while the average accuracy for the same technique was 96.0%. On the other hand, the Naive Bayes classifier achieved an accuracy score of approximately 93.33%. The results show promise in accurately predicting the identification of patients with chronic renal disease.

Keywords: Chronic renal disease, Machine learning models, Naive Bayes classifier, Pathological, The Chi-Square feature selection method.

INTRODUCTION

The kidneys are vital organs in the human body. The organs are bilaterally situated on opposite sides of the body. They provide a variety of functions within the human body, such as filtering blood to eliminate waste and excess fluid. Although filtration is a primary role of the kidneys, they also carry out various other activities, including the crucial activation of Vitamin D, which is essential for calcium absorption and maintaining healthy bones [1]. The body regulates electrolytes (such as sodium, potassium, and calcium), maintains the balance of

---

* **Corresponding author Sujoy Mondol:** Computer Science & Technology, Sharda University, Greater Noida, (U.P.), India; E-mail: sujoy.mondol5r8@gmail.com

acids and bases, controls blood pressure (by producing renin), and produces hormones that stimulate the production of red blood cells in the bone marrow (*via* erythropoietin) [2, 3]. Chronic kidney failure refers to the progressive decline in kidney function, resulting in renal failure and the deterioration of kidney structure [4]. Renal failure impairs the kidney's filtration function, resulting in the accumulation of waste products in the body. CKD, or chronic kidney disease, refers to a persistent abnormality in kidney structure or function that lasts for more than three months [5]. The condition impacts around 19 million individuals in the United States, and its prevalence is quickly rising. The disease is mostly linked to the identification of many underlying health disorders, such as diabetes mellitus, hypertension, a history of cardiovascular health complications, and a family history of the disease. These disorders primarily cause the majority of diagnosed instances of chronic kidney disease. Approximately 40-60% of individuals who are advancing toward late-stage renal disease have diabetes, while 15-30% have hypertension. The user's text is "[6]".This is a progressive ailment that can result in irreversible kidney damage or possibly renal failure. The initial phases of chronic kidney disease (CKD) may exhibit minor or no symptoms, such as fatigue or frequent urination. While the progression of the disease may go unnoticed as it advances, individuals may start to observe elevated levels of protein or creatinine in their urine during the initial stages. In advanced stages and severe instances, renal failure may occur, necessitating the patient's dependence on dialysis for blood purification or the need for a kidney transplant. The mortality rate of end-stage renal illness is 24% [7]. Chronic kidney disease is incurable. This underscores the significance of promptly detecting CKD in individuals, as diagnosing it at earlier stages not only facilitates prevention and slows down its advancement but also reduces the financial burden on patients, as treatment costs escalate exponentially as the disease progresses. Here, we utilize machine learning models to forecast and diagnose chronic kidney disease precisely. The datasets of chronic kidney disease contain numerous features that can potentially result in overfitting and inaccurate outcomes. Therefore, in this study, we employ the Chi-Square feature selection method to identify the most pertinent features for predicting chronic kidney disease in individuals.

LITERATURE SURVEY

Machine learning methods are progressively being embraced in several areas, including the healthcare industry. The utilization of machine learning methodologies might significantly augment the efficacy of systems and clinical aid by facilitating intelligent recognition and diagnosis of diverse ailments and disorders. There has been discussion over the use of machine learning techniques to detect and identify chronic kidney disease by applying various models and datasets [8]. The authors of a study [9] investigated the capacity of machine

learning to enhance early diagnosis and cost-effectiveness. In a study [10], a dataset consisting of 24 characteristics from 400 patients was evaluated. The researchers utilized recursive feature elimination to determine the most important attributes. Four classification approaches, specifically support vector machine (SVM), k-nearest neighbors, decision tree, and random forest, were employed. Out of all the classifiers, the random forest classifier demonstrated superior performance by achieving flawless accuracy, recall, precision, and an F-1 score of 100%. Multiple studies and research [11] have consistently shown that the random forest classifier has the highest accuracy, as reported by numerous authors in the field. The researchers, in their study,[12] performed a thorough examination of different classifiers, including random forest, Naive Bayes, logistic regression, and SVM, to investigate, ascertain, and assess their performance. The evaluation of each machine learning model was conducted using measures including accuracy, sensitivity, specificity, and AUC score. The findings demonstrated that the random forest classifier, when combined with random forest feature selection, achieved the best level of accuracy. The researchers [13] utilized various machine learning algorithms, such as random forest, support vector machine (SVM), and decision tree, to conduct both binary and multi-classification prediction tasks. By employing cross-validation, certain techniques, such as analysis of variance and recursive feature reduction, were used to choose features. The experimental findings demonstrated that random forest while utilizing recursive feature removal achieved superior performance compared to SVM and DT. The J48 approach exhibited the highest accuracy rate of 99% in comparison to other classifiers, such as Naive Bayes, SVM, and K-Star, as evidenced by the conducted tests. The tests were performed on a dataset of 400 individuals and 25 characteristics [14]. Moreover, some research has discovered that different feature selection strategies can enhance the precision of various classifiers. A study [15] employed a dataset including 400 patients and 24 variables for their analysis. The data analysis was conducted using the artificial neural network (ANN) and the SVM classifier. The findings demonstrated that the artificial neural network (ANN) classifier surpassed the support vector machine (SVM) classifier, with a remarkable accuracy of 99.75% in contrast to the SVM classifier's accuracy of 97.75%. Furthermore, numerous authors have employed deep neural networks, as exemplified in a study [16], wherein Ant Lion Optimization is incorporated with a deep neural network. The authors [17] utilized an improved version of the extreme gradient boosting (XGBoost) method to attain cost and time effectiveness. The optimized model achieved a sensitivity, specificity, and testing accuracy of 1.000, indicating excellent performance in all three metrics. The authors of a study [18] employed two ensemble strategies, bagging and random subspace methods, in conjunction with three base learners to improve the classification performance of the models. Prior to the evaluation, the data

Blockchain for Electronic Health Record

Shubham Kumar Mishra[1,*]**, Pratyush Prashar**[1] **and Priyanka Tyagi**[1]

[1] *Information Technology Sharda University, Plot No. 32-34, Knowledge Park III, Greater Noida, Uttar Pradesh 20131, India*

Abstract: Blockchain has the potential to revolutionize the sharing and preservation of patient's electronic health records by offering secure means for information exchange during care transitions and ensuring their safety on a decentralized peer-to-peer network. An exhaustive and methodical examination of the literature was undertaken to locate the latest study on blockchain technology in the healthcare sector. The objective was to identify the present obstacles and unanswered queries in order to facilitate and streamline comprehension of this era of decentralized record-keeping. The reassessment was prompted by the increasing number of examination questions related to electronic health records (EHR) within a blockchain. The primary objectives of our organized framework are to initially leverage blockchain technology for electronic health records (EHR) and then establish user-friendly electronic data storage capabilities through the implementation of detailed access controls.

Keywords: Blockchain, Decentralized, Electronic health records, Healthcare, Peer-to-peer network.

INTRODUCTION

The latest technological breakthrough profoundly influences all facets of human existence and fundamentally alters our conventional perception and understanding of the world. Just like how technology has transformed all aspects of our lives, it is now uncovering fresh avenues for expansion in the fitness care industry. The primary benefits that technological advancements are providing to the care business include enhancing security, improving user comprehension, and addressing several other concerns. Ensuring interoperability in healthcare is crucial, particularly in the context of exchanging electronic health data, due to the following reasons [1]:

Rapid and straightforward retrieval of patient information: Patients receive healthcare services from various care institutions, including public health clinics,

---

[*] **Corresponding author Shubham Kumar Mishra:** Information Technology Sharda University, Plot No. 32-34, Knowledge Park III, Greater Noida, Uttar Pradesh 20131, India; E-mail: shubham@ug.sharda.ac.in

school clinics, medical groups, urgent care centers, pharmacies, laboratories, and hospitals. Cultural variables, the standard of care, bedside manner, and proximity all play a role in the choosing of healthcare practitioners [2]. Data fragmentation significantly amplifies the probability of errors when healthcare professionals attempt to integrate data from many sources. Statistics indicate that 20% of medical errors leading to a negative drug incident in a hospital setting were caused by a lack of accessible patient information [3].

Enhancing the Productivity of Healthcare Professionals: An interconnected healthcare system has the potential to significantly improve healthcare by minimizing superfluous paperwork and redundancy [4].

Cost reduction in the national healthcare system: Inadequate information sharing leads to a significant amount of healthcare costs being attributed to repeated diagnoses and laboratory tests. The elimination of these unnecessary repetitions can be greatly aided by the ease of accessing the data within a compatible health system. Semantic interoperability refers to the ability of multiple systems to exchange data while preserving its meaning [5].

Although healthcare system interoperability offers numerous advantages, it encounters several challenges. Medical data, including genetic information, computed tomography, and X-ray images, are of substantial size and are expanding at an annual rate of 30% to 50%. In 2016, an average American healthcare professional possessed 660 terabytes of patient data. The predominant portion of this data consisted of unstructured medical photographs, which represents the primary concern. The volume of healthcare big data is projected to reach 35,000 petabytes by 2025, based on current growth rates.

Diversity in healthcare information systems: The issue of cross-institutional information interoperability is becoming increasingly significant due to the utilization of several healthcare information system providers that employ multiple multi-platforms with distinct system architectures, infrastructures, and databases.

Medical knowledge is estimated to double every 70 days, which increases the value and prevalence of healthcare data [6]. Therefore, it is crucial to prioritize ensuring that patients have full access to their medical records while also protecting the security and accuracy of health data. The primary advantages of implementing a blockchain strategy for managing distributed ledgers lie in the enhanced security measures and the individuals' capacity to exercise control over their information. This is of utmost importance considering recent alarming trends of data breaches at major hospitals [7] and a growing movement among individuals who, naturally, desire transparency in the utilization of their data.

This concise paper outlines a perspective on how decentralized healthcare records, safeguarded by blockchain technology, can be understood in relation to patient rights, confidentiality, and online security. The utilization of a blockchain-based electronic health record (EHR) system offers numerous advantages, such as enhanced security, transparency, interoperability, and granting patients complete control over their data. Blockchain technology ensures the encryption and decentralized storage of patient health information to safeguard it from hackers and other security threats [8]. Moreover, it facilitates transparent and verifiable transactions, granting patients the capability to access their health data and monitor the individuals who have accessed it and the corresponding timestamps. Fig. (**1**) shows the flowchart.
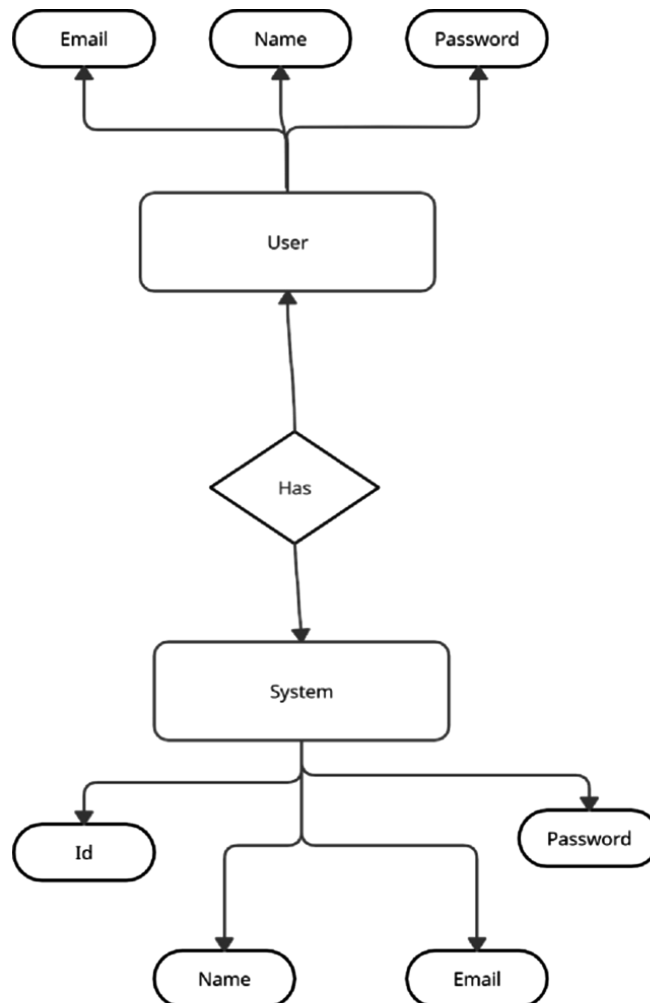
Fig. (1). ER Diagram.

A Systematic Review: Technology for Battery Management System

Divya G.[1,*] and **Venkata Padmavathi S.**[2]

[1] *Electrical and Electronics Engineering, CVR College of Engineering, Telangana, Hyderabad, India*

[2] *Gitam School of Technology, Gitam Deemed to be University Telangana, Hyderabad, India*

Abstract: Electric vehicles have garnered significant attention in recent years due to their little environmental impact and reduced maintenance expenses. Despite its numerous benefits, the primary drawback lies in the need for more charging stations and infrastructure. Therefore, it is crucial to accurately estimate the state of charge (SOC) of the battery and determine the position of a nearby battery station for battery switching or charging. This paper discusses two previously conducted research studies and their potential future advancements. The first study focuses on utilizing the Internet of Things (IoT) to educate vehicle owners about the battery health monitoring of hybrid electric vehicles (HEV). The Internet of Things (IoT) is crucial for the supervision and management of batteries. Furthermore, a charging station equipped with battery swapping/charging capabilities is provided to owners of hybrid electric vehicles (HEVs) through the utilization of advanced technology.

Keywords: Batteries, Charging station, Hybrid electric vehicles (HEV), Internet of Things (IoT), Infrastructure.

INTRODUCTION

Following the COVID-19 pandemic, there has been a significant surge in the number of automobiles on the road. Consequently, the increase in vehicle traffic led to a rise in pollution levels. Electric vehicles have yet to gain full acceptance in the automobile industry, and the majority of purchases are still made for vehicles that run on fossil fuels. According to the IBB research, the number of units sold has risen from 3.9 million to 4.4 million between the years 2020 and 2022. Due to the surge of internal combustion engine (ICE) vehicles, the pollution levels in several cities in India have exceeded the predicted range given by the

---

* **Corresponding author Divya. G.:** Electrical and Electronics Engineering, CVR College of Engineering, Telangana, Hyderabad, India; E-mail: divya.gongidi@cvr.ac.in

World Health Organization (WHO) by a factor of ten [1]. Additionally, PM 2.5 particles, which are minuscule dust particles, pose a significant threat to human health and can significantly shorten lifespan. The concentration of PM 2.5 particles has doubled as a result of the increase of vehicles on the road. The mitigation of this extensive harm to the environment and human well-being can be achieved through the reduction of the commercialization of internal combustion engine (ICE) automobiles. An alternative to internal combustion engine (ICE) automobiles is to enhance the adoption of electric vehicles (EVs) across various models. An important issue in hybrid electric vehicles (HEV) and electric vehicles (EV) is the limited range before needing to recharge the car. The limited availability of accurate battery health data and charging infrastructure is hindering the widespread adoption of electric and hybrid vehicles in the market. The BMS (Battery Management System) is a crucial component that follows the electric motor in the EV (Electric Vehicle) family. BMS will oversee and regulate the battery process [2]. Providing effective control and monitoring, as well as ensuring safe operation, it also facilitates the collection of vehicle battery data for storage in a remote control location. If the battery's condition is known and an alarm is triggered to indicate the immediate need for battery replacement, it is necessary to communicate with the nearest charging station promptly. This feature enables the vehicle owner to proceed with the replacement of the battery promptly. There should be a platform that stores the data of charging stations in a decentralized manner, using a secure technique for data transfer. This study explores the application of IoT in monitoring battery health, as well as the usage of IoT technologies for battery swapping or recharging.

BATTERY MANAGEMENT SYSTEM

Battery management system (BMS) plays a crucial role in electric vehicles, as these vehicles heavily rely on the battery and electric motors included within them. The BMS system should monitor the charging and discharging methods in order to preserve the battery's lifespan [3] and utilize the stored energy for extended periods. Battery management systems (BMS) play a crucial role in electric vehicles, as these vehicles heavily rely on the battery and electric motors included within them. The BMS system should monitor the charging and discharging methods in order to preserve the battery's lifespan [3] and utilize the stored energy for extended periods.

BMS in use

The existing BMS system for EV/HEV needs to be more developed in comparison to other BMS systems found in devices like laptops. The BMS system in EV/HEV must effectively handle many cells that operate at high voltages and

currents. The battery management system (BMS) for electric and hybrid electric vehicles (EV/HEV) is getting increasingly intricate [4]. The implanted sensors provide data sensing.

Battery-health specifics: The battery management system (BMS) should accurately measure the voltage of each cell and monitor the current passing through the system [5].

The BMS organization consists of three primary divisions.

1. Monitoring the status and performance of batteries.
2. Managing the operation and maintenance of batteries.
3. State of the battery.

BMS Functions

The battery management system will perform four primary duties, including

- Monitoring battery parameters.
- Managing temperature.
- Calculating battery parameters.
- Establishing communication.

The BMS system performs the crucial role of monitoring battery parameters. Monitoring is conducted for each cell's voltage, current, temperature, and state of charge (SOC).

The temperature has a significant impact on battery life. The temperature monitoring system is responsible for completing this task. Utilizing air as a coolant is the most straightforward method to reduce the temperature of a battery. The addition of air coolant to the car will result in an enlargement of its dimensions, hence diminishing the efficiency of the battery. Fig. (**1**) depicts the battery management system.

The battery calculations for each cell are performed based on the input and output voltage and current. These will also encompass internal impedance, kilowatt-hour energy sent in the last cycle, energy supplied, and charging/discharging cycles [6], as shown in Fig. (**1**).

An Intuitionistic Fuzzy EOQ Model Based on Trapezoidal Intuitionistic Fuzzy Numbers to Maintain a Green Environment by Disposing of Waste

Surendra Singh[1,*], Ayu Kumar Jain[1], Manish Aggarwal[1] and **Istakbal Khan[1]**

[1] *Department of Applied Science & Humanities,Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India*

Abstract: IFSs, or intuitionistic fuzzy sets, are flexible and often helpful tools for explaining the ambiguity and uncertainty present in decision-making situations. This study's main goal is to show how the IFS can be relevant and helpful when making judgments in uncertain scenarios by using inventory difficulties. In this paper, we use trapezoidal intuitionistic fuzzy numbers (TrIFNs) to create an intuitionistic inventory model with waste disposal cost from a crisp model. Lastly, a comparison between the intuitionistic fuzzy and crisp models for the optimal values of inventory level and total inventory cost is illustrated by a numerical example. The paper ends with a summary of potential future research.

Keywords: EOQ model, Trapezoidal intuitionistic fuzzy number, Waste disposal cost, α-cut method.

INTRODUCTION

Inventory refers to a compilation of merchandise or goods that have financial value and are now awaiting sale. Inventory is categorized as a current asset in a company's balance sheet. Inventory models have significantly contributed to the advancement of the industry [1]. Manufacturing businesses frequently employ economic order quantity and production quantity models to manage inventory costs. In order to ensure the success of the sector, it is crucial to promptly meet customers' expectations and maintain a steady production and ordering pace to prevent shortages. The number of flaws in a product is determined by the proportion of defects it possesses [2]. In order to convert a flawed product into a

---

[*] **Corresponding author Surendra Singh:** Department of Applied Science & Humanities,Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India; E-mail: surendra.singh@hietgroup.org

flawless one, it is necessary to reprocess waste elements, which leads to waste in the manufacturing process for industries. Additionally, faulty products and used materials must be discarded as they occupy storage space in inventory. Currently, academics are utilizing the IFS theory in various domains of optimization issues [3]. Several writers, including Ouyang and Pedrycz (2016), Garai (2018), Chaudhary and Kumar (2022), and Singh and Kumar (2022), utilized IF numbers in the development of inventory models. Furthermore, Supakar and Mahato (2022) have introduced a solitary product economic order quantity (EOQ) model specifically designed for deteriorating products and a pre-payment policy within an inventory financing (IF) setting. TIFN was employed for handling fuzzy parameters, while the sign-distance method was utilized for the process of defuzzification [4]. The non-linear pentagonal IFN was invented by Chakrabortty (2022) and employed in an EPQ model with steady demand and imperfect goods for remanufacturing. The defuzzification of non-linear PIFN was performed using the (α, β)-cut technique. In his study, Kumar (2022) created a continuous review inventory model that incorporates the yearly demand rate as a TIFN and the lead time demand rate as a triangular IF random variable. Classical set theory is not suitable for modeling problems that involve qualitative or erroneous information. In 1965, L. A [5]. Zadeh introduced the concept of fuzzy sets (FS) to represent the uncertainty inherent in real-world problems. Intuitionistic fuzzy numbers accurately represent real-world problems that involve uncertainties and incomplete knowledge. Trapezoidal intuitionistic fuzzy numbers excel in representing the imprecise and partial nature of a dataset. A fuzzy set consists of an element and its corresponding membership degree [6]. The theory of FS has gained significant popularity across various disciplines, and numerous exemplary investigations have been done. Atanassov proposed the intuitionistic fuzzy set (IFS) theory in 1986, which involves estimating degrees of membership and non-membership. The individual conducted an examination and categorized various IFS behaviors and relationships. Subsequently, other writers carried out thorough research [7]. G. Deschrijvera and E.E. Kerre (2002) conducted additional research on intuitionistic fuzzy sets. K. Das, T. K. Roy, and M. Maiti constructed a multi-objective fuzzy inventory model that considers a limited period, different shortage situations, and the deterioration of products. Wang, Tang, and R. Zhao employed the particle swarm optimization (PSO) method to solve a fuzzy economic order quantity (EOQ) model that involves defective items. D.F. Li (2010) examined the usefulness and uncertainty of triangular intuitionistic fuzzy numbers (TIFNs) in a ratio ranking strategy of TIFNs for addressing multiple attribute decision-making (MADM) problems. G. C. Mahata and A. Goswami researched fuzzy inventory models for poor-quality items with shortages. They utilized trapezoidal and triangular fuzzy numbers in two distinct models, which were defuzzified using the GMI approach [8]. The researchers then

compared both models using numerical examples. In their 2014 study, Sujit Kumar De and Shib S. Sana examined a production-inventory model for many manufacturers. They specifically focused on analyzing and evaluating the use of GFO (Global Fixed Order) and IFO (Individual Fixed Order) policies in production plants, incorporating a scoring system. In their study, Ejegwa, Akubo, and Joshua utilized the iterated function system (IFS) and applied it to career determination [9]. They used the normalized Euclidean distance approach to calculate the shortest distance between a student and a vocation. S. K. Singh and S. P. Yadav used TIFN to convert a transportation problem with total fuzziness into an IF transportation problem. They then employed the IF-modified approach to remove fuzziness and find the optimal solution. Y. He, Z. He, and H. Huang developed a collection of IF power interaction aggregation operators to facilitate decision-making [10]. In their study, Nayagam, Jeevaraj, and Dhanasekaran devised a technique that employs interval-valued intuitionistic fuzzy numbers (IFNs) and a non-hesitance scoring function to address decision-making problems. In their study, S. Merline Laura *et al.* [11] (2020) developed a fuzzy inventory EOQ model based on a crisp model that incorporated waste disposal cost. They found that the cost was optimized in a fuzzy manner. This work applies an EOQ (Economic Order Quantity) inventory model to a setting that involves intuitionistic fuzzy environments, utilizing TrIFNs (Type-reduced Intuitionistic Fuzzy Numbers) [12]. The subsequent sections of this article are organized in the following arrangement: The early definitions for several sorts of fuzzy integers are provided in Section 2, along with their corresponding defuzzification procedures [13]. The model's evolution is accompanied by notations and assumptions, which are outlined in Section 3. In Section 4, we formulate a classical EOQ inventory model within a crisp, intuitionistic fuzzy framework [14]. Section 5 is a numerical example that includes a comparative examination of the findings obtained from the different models [15]. Section 6 provides a concise summary of the study's findings.

RELATED WORKS

Fuzzy logic and green environment management are the primary topics of the connected works of the chapter 'An Intuitionistic Fuzzy EOQ Model based on Trapezoidal Intuitionistic Fuzzy Numbers to Maintain a Green Environment by Disposing of Waste' [16]. These works cover a wide range of issues, including creating an environmental management inventory control model, managing green waste with fuzzy logic, and optimizing waste disposal with fuzzy logic. To ensure sustainable environmental management, a fuzzy logic-based inventory control model has been created in one linked study [17]. To lessen environmental damage, the suggested approach mixes fuzzy logic with economic order quantity (EOQ) logic. The study's findings demonstrated that the fuzzy EOQ model

Foliar Disease Detection Using ML and Deep Learning

Aman Shrivastava[1], Bhaskar Sharma[1], Somaya Goel[1], Sumit Kumar[1], A.K. Jain[1] and **Shalini Kapoor[1,*]**

[1] *Department Electrical Engineering Hi-Tech Institute of Engineering & Technology, Ghaziabad, (U.P), India*

Abstract: This research surveys the classification approaches that can be utilized to categorize plant leaf diseases. Contemporary farming practices have the potential to provide sustenance for the 7.6 billion individuals on the Earth. Despite the availability of sufficient food, some persist in experiencing malnutrition. Plant diseases have a negative impact on both the yield and the quality of the entire crop. Several obstacles need to be addressed during the development of an image-processing model for prediction or classification purposes. Identifying indicators of sickness visually might pose a challenge for farmers. Computerized image processing technology is employed to safeguard crops in large-scale settings by utilizing color information from leaves to identify damaged foliage. Several classification methods exist, such as support vector machine (SVM), probabilistic neural network, k-nearest neighbor classifier, genetic algorithm, and principal component analysis. Due to the potential for various input data to yield varying quality outcomes, the selection of a classification approach is consistently a tough task. Plant leaf diseases are commonly classified in several industries, such as agriculture, biotechnology, and scientific research.

Keywords: Agriculture biotechnology, Classification, Industries, Support vector machine.

INTRODUCTION

Plant diseases result in decreased yields, which directly impact both domestic and international food supply systems and result in financial losses [1]. The Food and Agriculture Organization (FAO) of the United Nations has reported that plant diseases and pests result in a loss of approximately 20% to 40% of the world's food output. Additionally, the FAO states that 13% of worldwide agricultural

* **Corresponding author Shalini Kapoor:** Department Of Computer Science KIET Group of Institute, Ghaziabad, (U.P), India; E-mail: shalkapoor311@gmail.com

yield losses can be attributed to plant diseases. This underscores the significance of detecting and averting plant diseases in order to minimize these detrimental effects [2]. An approach to detect plant illnesses involves the examination of plant leaf pictures using a technology known as "image processing", which is a subfield of signal processing. Through the utilization of artificial intelligence, particularly machine learning, we can effectively extract significant data from these photos to identify and diagnose plant illnesses precisely [3]. Additionally, this technology can autonomously execute tasks or provide directions for their execution. The fundamental objective of machine learning is to comprehend the training data and integrate it into models that are beneficial to people. Therefore, it can assist in making informed choices and accurately predicting the desired outcome by utilizing extensive training data. Leaf color, leaf damage level, leaf area, and leaf texture features are employed for classification [4]. Multiple types of plant diseases harm different plant organs. Foliar diseases, which are plant diseases that exhibit symptoms on leaves, can be readily identified by plant pathologists. Fungal pathogens are a significant contributor to reductions in crop productivity, responsible for as much as 50% of overall yield losses [5]. Consequently, numerous researchers are employing computer vision, machine learning, and deep learning methodologies to identify and diagnose plant diseases by analyzing photos of plant leaves [6]. Efficient diagnosis of plant diseases necessitates timely detection of diseases, identification of many diseases across various crops, assessment of disease severity, determination of the optimal pesticide dosage, and implementation of practical actions to control and contain the disease.

RELATED WORKS

This section focuses on relevant developments in addressing classification challenges using deep learning systems [7]. Deep learning techniques have been extensively studied for their applicability in areas such as object recognition and image categorization. Convolutional neural networks (CNNs), a type of deep learning technology, are highly effective in solving recognition and classification problems, particularly in the field of photo classification, where they achieve state-of-the-art performance [8]. The initial convolutional neural network (CNN) model, named Mobile Net, was assessed for its ability to recognize objects, specifically focusing on tomato diseases, using a specific dataset [9]. The degree of tomato leaf illness was assessed using pre-trained CNN architectures VGG16, MobileNet, and ResNet50, applied to pictures of tomato leaves [10]. The performance of the standard CNN model was enhanced by using ResNet50 characteristics, as shown in Fig. (**1**).
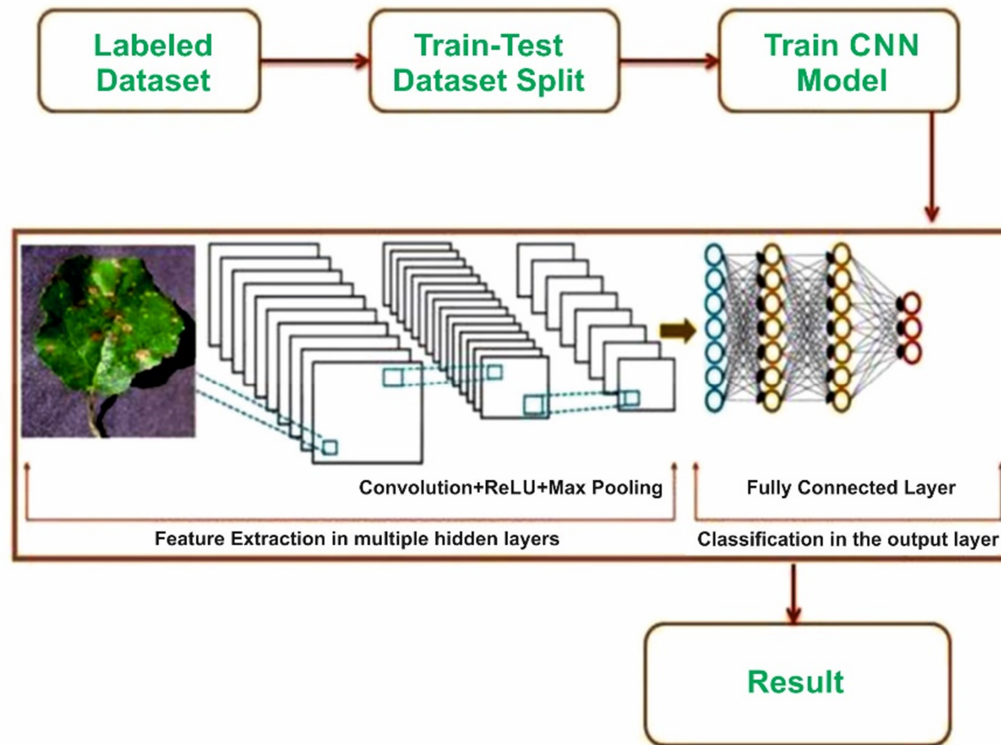
Fig. (1). Proposed Workflow.

CNN designs do not examine the spatial connections between the different portions of an image, which renders them unsuitable for handling geometric transformations [11 - 17]. The max-pooling layer of a CNN has a propensity to lose data when it routes features from one layer to another. They cannot accurately represent the property of rotational invariance in an object. The section introduces a capsule network with a dynamic routing algorithm as a solution to address the limitations of CNN design [18 - 20]. The trials utilized capsule networks to classify illnesses based on medical imaging, and they outperformed ordinary CNN in this task.

EXISTING WORK

Prior studies on detecting leaf damage using CNN provide an example of how to recognize and classify leaf disease using image processing techniques, as shown in Fig. (**2**).

SUBJECT INDEX

Pankaj Kumar Mishra

Pankaj Kumar Mishra is a dynamic and innovative director with a doctoral degree in mechanical engineering. He has an exceptionally brilliant two decade long experience in teaching and research. He is a multifaceted leader and an expert in curriculum development, program coordination and staff supervision. His ability to facilitate collaborative environments, improve student outcomes and foster a culture of academic excellence is profound. He is a vivid researcher and has more than 40 publications in refereed international/national journals and conferences and edited several conference proceedings. He has authored and reviewed some books and has been an active member of many professional societies. He was awarded with 'Teachers Excellence Award 2017⊠ by Confederation of Education Excellence for outstanding contribution in Education.

Satya Prakash Yadav

Satya Prakash Yadav (SMIEEE) is currently the associate professor of the School of Computer Science Engineering and Technology (SCSET), Bennett University, Greater Noida (India) and has completed postdoctoral research fellow from Federal Institute of Education, Science and Technology of Ceará, Brazil. He was awarded a Ph.D. from Dr. A.P.J. Abdul Kalam Technical University (AKTU) (formerly UPTU). Currently, 6 students are working for Ph.D. under his guidance. He has more than 17 years of experience as academician, and has published four books (Programming in C, Programming in C++ and Blockchain and Cryptocurrency) under I.K. International Publishing House Pvt. Ltd. His area of specialisation is image processing, information retrieval and features extraction. Besides, he is editor in chief of the Journal of Cyber Security in Computer System & Journal of Soft Computing and Computational Intelligence (MAT journals).