





### **PROCEEDINGS**

# shaastrarth 2025

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### 10th International Conference on

### **AI-Driven Innovations**

in Engineering, Health Sciences & Sustainability

28th & 29th June 2025

Organized by

Rungta College of Engineering & Technology, Bhilai



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#### NABARD, Raipur

### **PROCEEDINGS**



#### 10th INTERNATIONAL CONFERENCE

### Al-Driven Innovations in Engineering, Health Sciences, and Sustainability

**JUNE 28 & 29, 2025** 

ISBN No.: 978-81-964426-1-3

Organized by

Rungta College of Engineering & Technology, Bhilai



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(Indian Society For Technical Education)



(The Institution of Engineers **Bhilai Local Chapter)** 

#### **MESSAGE**



#### भारतीय प्रौद्योगिकी संस्थान भिलाई

जिला-दुर्ग, छत्तीसगढ़-491001

Indian Institute of Technology, Bhilai

Dist.- Durg, Chhattisgarh - 491001 Website: www.iitbhilai.ac.in

#### Message



Dear Participants,

It gives me immense pleasure to extend my warmest greetings to all participants of the 10th International Conference – Shaastrarth 2025, focused on Al-Driven Innovations in Engineering, Health Sciences, and Sustainability, and organized by Rungta College of Engineering and Technology, Bhilai.

As we celebrate the 10th edition of this prestigious conference, the focus on artificial intelligence and its transformative potential across critical sectors could not be more timely. In an era where innovation drives societal progress, this conference provides an excellent platform to explore the intersections of AI with engineering solutions, healthcare advancements, and sustainable practices.

Shaastrarth 2025 is more than an academic gathering—it is a confluence of ideas, expertise, and aspirations. Through keynote sessions, paper presentations, and interactive workshops, I encourage all participants to contribute wholeheartedly, fostering interdisciplinary dialogue and meaningful collaboration.

I am confident that the insights shared and networks built during this event will inspire impactful research and innovation, ultimately contributing to a more intelligent, healthier, and sustainable future for all.

Wishing you all a highly engaging and fruitful experience at Shaastrarth 2025.

Best regards,

Prof Rajiv Prakash Directror, IIT Bhilai









#### राष्ट्रीय प्रौद्योगिकी संस्थान रायपुर NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR



(An Institute of National Importance)
Under Ministry of Education, Govt. of India

PROF. N.V. RAMANA RAO
M.Tech (IITD), PGDCS (UOH), Ph.D (UK), Post Doc. (UK)
Director

#### MESSAGE



t is a pleasure that Rungta College of Engineering is organizing '10<sup>th</sup> International Conference 'Shaastrarth 2025' on the topic 'Al-Driven Innovation in Engineering,

Health Science and Sustainability' on 28th & 29th June, 2025.

I am happy to note that the Conference has received large number of papers in the above topics.

Today AI is not just a tool but a transformative force driving unprecedented innovation across Engineering, Health Sciences, and Sustainability. It enhances efficiency, accuracy, and discovery, while enabling solutions to some of humanity's most pressing challenges, from disease and climate change to resource scarcity. Responsible development and deployment are key to maximizing its positive impact.

This conference stands a a testament to the power of collaboration, innovation and scholarly disourse in shaping a sustainable future. The collective efforts invested in this event signify our shared commitment to addressing global challenges through cutting edge research and technological advance, ents.

This is a great opportunity for researchers, faculties and scientists to share their research ideas which will help in the advancement in the relevant domains. I hope this event a grand success and congratulate the entire organizing team for conducting this International Conference foro the  $10^{\rm th}$  iteration.

[Prof. N. V. Ramana Rao] NIT Raipur

N.V.

#### प्रो. (डॉ.) संजय तिवारी कुलपति

कुलपित पीएच.डी., यूएस फुलब्राइट फेलो, अकादमिक फेलो (कैम्ब्रिज विश्वविद्यालय) एफ-यूके आईई आर आई, एफ-आई.ई.ई.ई., एफ-आई.ई.टी.ई. चार्टर्ड इंजीनियर (भारत) सीनियर एसोसिएट - आई.सी.टी.पी. (इटली), फैलो - इंस्टिट्यूशन ऑफ इंजीनियर्स (भारत) प्रमाणित प्रवंधन नवप्रवर्तक - आजीवन सदस्य (यू.के.)



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रायपुर नाका / पोटियाकला, दुर्ग, छत्तीसगढ़ - 491001, भारत

#### HEMCHAND YADAV VISHWAVIDYALAYA

Raipur Naka / Potiakala, Durg, Chhattisgarh - 491001, India

#### Prof. (Dr.) Sanjay Tiwari Vice-Chancellor

Ph.D., US Fullbright Fellow, Academic Fellow (Cambridge University)
F-UKIERI, F-IEEE, F-IETE, Chartered Engineer (India)
Senior Associate - ICTP (Italy), Fellow - Institution of Engineers (India)
Certified Management Innovator - Life Member (UK)

No.: 29/VC/HYV/2025 Durg, Date: 06.06.2025



#### MESSAGE

It gives me immense pleasure to extend my warmest blessings and best wishes to Rungta College of Engineering and Technology, Bhilai, on the occasion of the 10th edition of your prestigious international conference, **Shaastrarth-2025**.

The chosen theme, "Al-Driven Innovations in Engineering, Health Sciences, and Sustainability," is both timely and visionary. In an era of rapid technological transformation, such platforms play a vital role in fostering global collaboration, encouraging interdisciplinary dialogue, and inspiring the next generation of researchers, innovators, and thought leaders.

I commend the organizers for curating a rich spectrum of sessions across disciplines—ranging from Artificial Intelligence and Engineering Innovations to Business, Humanities, and Agricultural Sustainability. I am confident that this confluence of minds will lead to meaningful insights and impactful outcomes.

May **Shaastrarth-2025** be a resounding success and a beacon of knowledge, innovation, and global partnership for years to come.

With best wishes for a productive and enlightening conference.

(Prof. (Dr.) Sanjay Tiwari) Vice Chancellor

To,

Dr. Manish Manoria Director General, Rungta Educational Foundation

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#### पं. रविशंकर शुक्ल विश्वविद्यालय, रायपुर (छत्तीसगढ़) — ४९२०१० भारत



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Raipur, Dated: June 23, 2025

#### **MESSAGE**

It is a matter of immense pleasure that Rungta College of Engineering and Technology, Bhilai is organizing "Shaastrarth 2025 – The 10th International Conference on Al-Driven Innovations in Engineering, Health Sciences, and Sustainability", on 28<sup>th</sup> - 29<sup>th</sup> June, 2025.

We live in a time where knowledge is both rapidly expanding and seamlessly converging across disciplines. The advent of Artificial Intelligence has redefined the contours of research, problem-solving, and sustainable development. Conferences like Shaastrarth are not just academic gatherings—they are vibrant crucibles of ideas that have the power to influence future directions of thought and technology.

The thoughtfully chosen theme of this edition reflects a commitment to excellence, innovation, and relevance. I am confident that this platform will inspire novel research, meaningful partnerships, and intellectual breakthroughs that will resonate well beyond the duration of the event.

I commend the organizers for creating such an enabling academic ecosystem and wish all participants insightful sessions, enriching collaborations, and a truly memorable experience at Shaastrarth 2025.

With best regards and warm wishes for the continued success of this scholarly endeavour.

(Prof. Sachchidanand Shukla) Vice-Chancellor Pt. Ravishankar Shukla University Raipur (Chhattisgarh)



#### **MESSAGE**

It brings me immense pleasure to extend a heartfelt welcome to all participants of Shaastrarth-2025, the 10th International Conference on AI-Driven Innovations in Engineering, Health Sciences, and Sustainability, being held on 28–29 June 2025.

Reflecting on the successful legacy of previous editions, including Shaastrarth-2024, which focused on Emerging Technologies and Multidisciplinary Research for Sustainable Development, I am proud of how this platform has evolved into a confluence of innovation, collaboration, and academic excellence.

Encouraging such international research forums is vital for fostering scientific curiosity and global competitiveness among young scholars and professionals. I am confident that the knowledge shared during this landmark 10th edition will inspire impactful solutions and lasting collaborations.

Congratulations to the organizing team, speakers, and participants for their continued dedication. I look forward to seeing the outcomes of this academic celebration reach far and wide.

With best wishes,

Mr. Santosh Rungta Chancellor Rungta International Skill University, Bhilai, Chhattisgarh





### Dear esteemed participants and distinguished guests,

It gives me great pleasure to welcome you all to Shaastrarth-2025, the 10th edition of our international conference, hosted by Rungta College of Engineering and Technology, Bhilai. This year, we proudly explore the theme:

"AI-Driven Innovations in Engineering, Health Sciences, and Sustainability."

Each edition of Shaastrarth has built upon the foundation of intellectual rigor, global relevance, and meaningful collaboration. From AI to sustainability, our focus remains on providing a dynamic platform for knowledge exchange across disciplines.

This conference brings together thought leaders, researchers, academicians, and industry experts to share transformative ideas, cutting-edge research, and novel applications. I trust that the discussions and deliberations over these two days will spark new partnerships and innovations.

My sincere appreciation to the organizing committee, invited speakers, and all participants whose collective efforts have made Shaastrarth-2025 a truly global event.

Wishing you all an enriching and memorable experience.

#### Dr. Sourabh Rungta

Pro Chancellor Rungta International Skill University, Bhilai, Chhattisgarh





#### Dear participants and esteemed guests,

It is a privilege to welcome you to the 10th International Conference – Shaastrarth-2025, centered on the timely and transformative theme of "AI-Driven Innovations in Engineering, Health Sciences, and Sustainability."

Shaastrarth has grown to symbolize our collective commitment to interdisciplinary research and academic excellence. As we celebrate the 10th edition, we also celebrate a decade of innovation, idea exchange, and impactful collaboration that transcends borders.

This conference is a tribute to our faculty, researchers, students, and global partners who continuously push the boundaries of knowledge. I hope these proceedings capture the energy, ideas, and outcomes of this inspiring event.

I extend my heartfelt thanks to the organizing committee and congratulate all contributors for making Shaastrarth-2025 a grand success.

Wishing you an insightful and impactful conference.

Mr. Sonal Rungta
CEO
Rungta International Skill University,
Bhilai, Chhattisgarh





#### Dear participants,

It gives me great pleasure to extend my warm greetings to all the delegates, speakers, and participants of Shaastrarth 2025 – The 10th International Conference on AI-Driven Innovations in Engineering, Health Sciences, and Sustainability, hosted by Rungta College of Engineering and Technology, Bhilai.

This conference stands as a symbol of our shared commitment to fostering interdisciplinary dialogue and promoting impactful research that addresses some of the most pressing challenges of our time. The theme of this year's event—exploring AI's transformative role across engineering, healthcare, and sustainability—is timely and visionary, reflecting the direction in which the world is rapidly moving.

At Rungta International Skill University, we believe in bridging the gap between knowledge and practice, between research and real-world relevance. Conferences like Shaastrarth create fertile ground where theory meets application, and where innovation is not just discussed but demonstrated. I am confident that the discussions, collaborations, and knowledge shared during Shaastrarth 2025 will spark new ideas, encourage practical innovations, and inspire lasting partnerships among academia, industry, and the community. I congratulate the organizing committee for curating a global academic platform of such quality and substance. I wish all participants a successful and enriching experience.

**Dr. Jawahar Surisetti**Vice Chancellor
Rungta International Skill University





#### Message from the General Chair

It is with great pride and a sense of fulfillment that I present to you the Proceedings of SHAASTRARTH 2025, commemorating the 10th edition of our flagship international conference. This compilation of abstracts

stands as a testament to the scholarly rigor, innovation, and interdisciplinary spirit that this conference has consistently fostered over the past decade.

The theme of this year's conference—AI-Driven Innovations in Engineering, Health Sciences, and Sustainability—captures the essence of our times. Artificial Intelligence has moved beyond theory and experimentation to become an enabler of tangible, crossdomain impact. From transforming engineering systems and revolutionizing healthcare delivery to offering novel solutions for environmental and societal sustainability, AI has emerged as a unifying catalyst of progress.

These proceedings encapsulate the intellectual contributions of researchers, practitioners, and scholars from diverse institutions and disciplines. Each abstract represents an idea—a seed of thought—that may influence future research, spark new collaborations, or find practical applications in the real world. We take immense pride in the quality and breadth of submissions received this year and thank all authors for their valuable work. I also wish to express sincere appreciation to the members of the technical and review committees for maintaining the academic integrity and quality of the conference through a rigorous selection process. My special thanks go to the organizing team, advisory board, and institutional collaborators whose unwavering efforts have made this event a success. As you turn the pages of this volume, may you find inspiration, insight, and a renewed sense of purpose in the pursuit of knowledge that benefits humanity and the planet.

Warm regards, **Prof. Manish Manoria**General Chair, Shaastrarth 2025
Pro-VC, Rungta International Skill University





#### Message

It is a matter of immense pride to welcome all delegates, researchers, academicians, and industry professionals to Shaastrarth 2025 – The 10th International Conference on AI-Driven Innovations in Engineering, Health Sciences, and Sustainability, hosted by Rungta College of Engineering and

Technology, Bhilai.

As we celebrate a decade of this academic and research-driven initiative, Shaastrarth continues to reflect our institutional commitment to fostering a robust and future-ready research and development ecosystem. This year's conference theme is both timely and transformative—placing artificial intelligence at the forefront of sustainable and interdisciplinary innovation.

Research is no longer confined within disciplinary boundaries. Today's global challenges demand collaborative inquiry and intelligent integration across domains. Through Shaastrarth, we aim to create a meaningful platform that bridges fundamental research, applied innovation, and industry impact.

The meticulously peer-reviewed technical papers featured in these proceedings are a testament to the intellectual rigor and scholarly contribution of the participating researchers. I am confident that the ideas disseminated during this conference will stimulate new perspectives, inspire collaborative ventures, and contribute to impactful scientific advancements.

I extend my sincere appreciation to the organizing committee, technical reviewers, partner institutions, and all contributors whose dedication and scholarly pursuit have made Shaastrarth 2025 a landmark edition. Let this decade of Shaastrarth be the foundation for even greater strides in academic excellence and R&D-led innovation.

With best regards, **Dr. Ajazuddin**Registrar and Executive Director – R&D

Rungta International Skill University



#### **PREFACE**

The organizing team of Rungta College of Engineering and Technology, Bhilai is delighted to extend a warm welcome to all esteemed delegates, guests, and contributors to the 10th edition of Shaastrarth – The International Conference on AI-Driven Innovations in Engineering, Health Sciences, and Sustainability, held on 28–29 June 2025 at the Rungta Educational Campus, Bhilai.

This commemorative 10th edition of the conference continues its legacy of providing a multidisciplinary platform for global academic, scientific, and industrial communities to engage in meaningful knowledge exchange. The proceedings presented here represent a curated selection of rigorously peer-reviewed papers showcasing original research, innovative methodologies, and practical advancements in the fields of Artificial Intelligence, Engineering, Health Sciences, and Sustainability.

Each submission has undergone a robust and critical evaluation process involving our Scientific Review Committee, external experts, and the editorial board, ensuring adherence to the highest standards of academic quality, relevance, and clarity. The conference has been greatly enriched by the contributions of internationally and nationally acclaimed keynote speakers, panelists, and session chairs. Their thought-provoking sessions provided attendees with a panoramic view of current trends and future directions in their respective disciplines, while also fostering interdisciplinary learning and collaboration.

The conference agenda was meticulously structured to promote interaction and cross-disciplinary networking among participants from academia, research institutions, and industry, enabling fruitful dialogue and potential long-term collaborations. We gratefully acknowledge the financial support received from the Research and Development Fund of the National Bank for Agriculture and Rural Development (NABARD) towards the publication of this volume. We also express our sincere thanks to our technical sponsors, ISTE and IEI, for their continuous support and encouragement.

Our heartfelt appreciation goes to the management of Rungta Educational Foundation, conference chairs, organizing committee members, reviewers, and supporting staff whose dedication and tireless efforts ensured the successful execution of Shaastrarth-2025. We also extend our gratitude to all authors and presenters whose contributions form the backbone of this academic event. We hope these proceedings will serve as a valuable resource for researchers, students, and practitioners and inspire further exploration, collaboration, and innovation. May Shaastrarth-2025 leave an enduring impact and continue to strengthen the spirit of research and discovery.

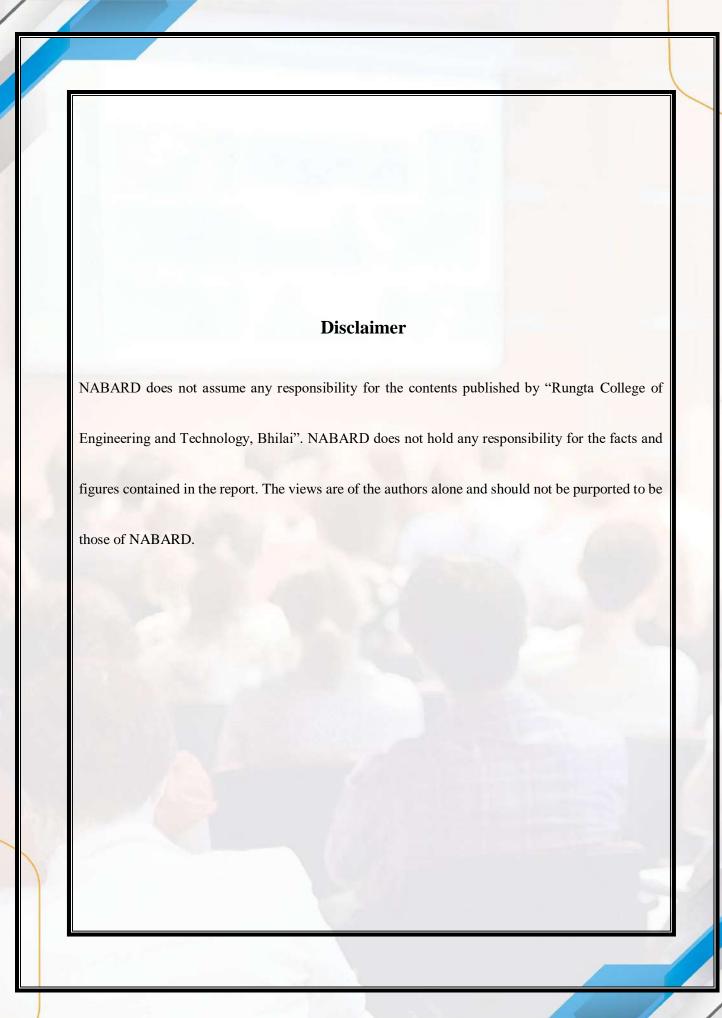
Warm regards,



Dr. Ram Krishna Rathore
Convener
Shaastrarth-2025



Dr. Padmavati Shrivastava Organizing Secretary Shaastrarth-2025



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10<sup>th</sup> International Conference

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AI-Driven Innovations in Engineering, Health Sciences, and Sustainability

**Keynote Speech** 

# AI in Software Engineering: A New Era of Development



Dr. Agostino Cortesi

Professore Ordinario di Informatica
Dipartimento di Scienze Ambientali, Informatica e Statistica
Università Ca' Foscari Venezia
Polo Scientifico - via Torino 155 Mestre-Venezia, Italy

#### **ABSTRACT**

This talk illustrates some possible ways in which artificial intelligence techniques can help the software engineer's work. In particular we will analyze how artificial intelligence allows the interpretation of unstructured requirements expressed in natural language, how AI can identify key entities in software specifications, facilitating model construction. Additionally, we see how AI can analyze user reviews to extract valuable insights, prioritize features, and improve app development, how AI can translate natural language requirements into formal goal models, and finally how AI can analyze existing code, generating summaries, documentation, and answering complex questions.

# Digital Transformation in Engineering: An Innovators Perspective



#### Dr. Pravansu Mohanty

Region 4 Manager External Relationships and Power Electronics Technical Fellow in John Deere Inc., USA.

#### **ABSTRACT**

Digital transformation in engineering involves integrating digital technologies into traditional engineering practices to enhance design, collaboration, analysis, and manufacturing processes, leading to increased efficiency and innovation. Machine learning (ML) solutions can take digital engineering to a new level, providing enhanced design, improved decision making, high efficiency and productivity, enhanced product quality and competitive advantage. While design and innovation can touch new heights and unlock hidden potential by embracing digital solutions, it is imperative to address some challenges and implement considerations to leverage these benefits. Digital transformation is not just a process of using new technology and software, but it represents doing business in a whole different way that requires adaptation across all stakeholders. This presentation will illustrate the journey towards digital transformation that is fraught with challenges including- data fidelity, legacy system integration, security concerns, and organizational mindset. Apart from these challenges, entrepreneurs/innovators need to keep some ethical considerations in mind such as algorithmic bias, job displacement and responsible systems that are in line with societal values.

# Supervised and unsupervised analysis of feature drift in a new type of detector: New conception



**Prof. Piotr Porwik** 

University of Silesia, Katowice, Poland Institute of Computer Sciences

#### **ABSTRACT**

Data stream analysis is a rapidly growing field driven by the prevalence of massive, dynamic datasets across various domains, including science, medicine, biometrics, and technology. Many data streams are inherently non-homogeneous, highly variable over time, and non stationary, presenting unique challenges for machine learning applications. This paper addresses the under explored phenomenon of feature drift - a type of drift where the importance of certain features diminishes while others become more relevant for predictive modeling. Feature drift necessitates continuous monitoring and adaptation of classification models to ensure high-quality predictions. We propose a novel feature drift detection algorithm that operates flexibly in supervised and unsupervised modes. The algorithm is evaluated using synthetic and real-world datasets, demonstrating its ability to detect and adapt to feature drift effectively. Additionally, we investigate various drift scenarios and assess the algorithm's performance across multiple features. The propose new feature drift detector generates a significantly lower number of false positive alarms than all researched concept drift detectors. Comparative analyses with state-of-the-art methods highlight the strengths of our approach in maintaining robust classification accuracy and reducing false detection. This research contributes to advancing adaptive machine-learning techniques for dynamic, real-world environments.

- Presentation shows a novel method based on observing changes in the ranks of features to detect drift in the data. Detection of feature drift is a specific case of concept drift.
- Presentation proposes the FIDD algorithm a drift detection method for batch processing non-stationary data streams.
- The FIDD method allows for the effective detection of changes in the distribution of features in data sets, enabling the identification of moments when significant changes have occurred.
- The method's adaptability allows it to analyze data from different periods, even with high variability; this makes it possible to track changes over the long term and adjust analytical models to changing conditions.
- It can be concluded that the FIDD method effectively detects concept changes in the processing of real data streams
- FIDD detector generates a significantly lower number of false positive drifts than all eleven researched concept drift detectors.
- The proposed method can be used in healthcare to analyze data from medical sensors.

# Computational Intelligence: An Intelligent Way of Problem Solving



#### Dr. Jagdish Chand Bansal

Associate Professor (Senior Grade), South Asian
University, Akbar Bhawan, Chanakyapuri,
New Delhi, India

#### **ABSTRACT**

With the development of advanced technology, computational requirements have become high. Usually, for high computational needs, traditional algorithms become infeasible. In such case, some intelligent way of problem solving is required and computational intelligence is one of them. Researchers have always been fascinated with computational intelligence and applied this to develop some advanced intelligent algorithms to solve the problems where either traditional approaches fail or infeasible to use. Genetic Algorithm (GA), Particle Swarm Optimization (PSO), Ant Colony Optimization (ACO), Artificial Bee Colony Algorithm (ABC), Biogeography Based Optimization (BBO) and Spider Monkey Optimization (SMO) are some of the algorithms in this category. These two lectures comprise some basic principles of computational intelligence, particularly of swarm intelligence and demonstrate how they are applied to develop intelligent algorithms. PSO, SMO and BBO algorithms will be detailed with numerical examples.

## Tangle in Distributed Ledger



Dr. Nabendu Chaki

Professor
University of Calcutta
Kolkata, West Bengal, India

#### **ABSTRACT**

Since time immemorial, ledgers have been used to record payments, contracts, and transfers of assets. The advent of computers has brought great convenience and speed to the activity of ledger maintenance. Further, with advancements in cryptography and security, information on the ledger is more accurately and securely stored. However, centralized ledgers are vulnerable to various kinds of cyber-attacks and a single point of failure. On the other hand, distributed ledgers are synchronized databases in which transaction records are maintained in a decentralized manner across multiple locations. The most talked-about distributed ledger technology in vogue is the blockchain. The blockchain is a list of blocks that are linked together using cryptographic hashes. However, it has been observed that the major limitation of blockchain is scalability. IOTA Tangle emerges as a new distributed ledger technology that aims to improve on the limitations of blockchain while keeping the advantages of the former.

10<sup>th</sup> International Conference

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AI-Driven Innovations in Engineering, Health Sciences, and Sustainability

TRACK 1- INTERNATIONAL
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SUSTAINABILITY THROUGH
EMERGING TECHNOLOGIES IN DATA
SCIENCE, ARTIFICIAL INTELLIGENCE,
CLOUD COMPUTING, AND MACHINE



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Organised by RUNGTA COLLEGE OF ENGINEERING AND TECHNOLOGY, BHILAI 28 – 29 June 2025

## | 0002 | Image Based Color Palette Generator

Shireen Fatima<sup>1, #</sup>, Tripti Sharma<sup>2</sup>

**Author Affiliations** 

<sup>1</sup> M Tech CSE 4th Semester, RCET <sup>2</sup> Professor & HOD, CSE Department, RCET

#### **ABSTRACT:**

1

In a world increasingly driven by visual communication and design intelligence, color plays a crucial role in defining user experience and functionality. This project introduces a web-based application that generates customized color palettes from user-uploaded images using the K-Means clustering algorithm. Unlike traditional palette tools, this application integrates six distinct use cases—ranging from military and aerospace to interior design and social media—providing contextual insights tailored to each field. The backend is built using Python and Flask, utilizing libraries such as NumPy, PIL, and ReportLab to process images, extract dominant colors, and generate detailed downloadable reports in PDF format. The interface, styled with HTML and CSS, offers a clean and user-friendly experience, making advanced technology accessible to creative professionals and technical users alike. This project stands at the intersection of machine learning, visual design, and real-world application, demonstrating how AI can drive sustainable design decisions across industries.

Keywords: Color Palette Generation, Image-based Color Extraction, Flask Web Application, HEX and CMYK Color Models, PDF Report Generation, Use-Case Based Color Insights,

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## | 0011 | Strengthening Cybersecurity in the Quantum Era: Transitioning to Post-Quantum Cryptography for Sustainable Digital Infrastructure

Kumari Shambhavi<sup>1, #</sup>, Ritinsh Kumar<sup>1</sup>, Arpit Kumar Mishra<sup>1</sup>, Om Pandey<sup>1</sup>, Sweta Raj<sup>1</sup> V. Hemant Kumar<sup>1</sup>

**Author Affiliations** 

<sup>1</sup>Rungta College of Engineering and Technology, Bhilai, C.G

#### **ABSTRACT:**

The rapid advancements in quantum computing pose an imminent threat to traditional cryptographic systems that underpin modern digital communication, infrastructure, and security. As we approach a new computational paradigm, the resilience of cryptographic protocols becomes a critical factor in ensuring the sustainability of digital ecosystems. This paper presents a comprehensive exploration of Post-Quantum Cryptography (PQC), focusing on the strategies, challenges, and implementation readiness required to mitigate quantum threats. Drawing from recent developments in lattice-based, hash-based, and multivariate polynomial cryptographic algorithms, the study highlights the urgency of transitioning toward quantum-resistant solutions. Key challenges such as algorithm standardization, integration into legacy systems, and computational overheads are examined, along with organizational readiness for widespread PQC adoption. Furthermore, the paper underscores the implications of quantum threats on sectors like blockchain, IoT, and secure telecommunications, emphasizing the need for early action and international collaboration. By addressing both technological and governance aspects, this research contributes to the discourse on sustainable and secure digital infrastructure in a post-quantum world. The outcomes aim to support engineers, policymakers, and technologists in preparing for a quantum-resilient future aligned with the broader goals of sustainable development and technological advancement.

Keywords: Post-Quantum Cryptography, Quantum Threat, Cybersecurity, Digital Infrastructure, PQC Transition, Quantum-Resilient Systems

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## | 0018 | Leveraging Big Data to Analyze Omicron Variant's Daily Case Progression

Huma Khan<sup>1,#</sup>, Aradhana Sahu<sup>2</sup>, Bhawna Janghel<sup>3</sup>, Shaziya Islam<sup>4</sup>, Shweta Bandhekar<sup>5</sup>, Tripti Sharma<sup>6</sup>

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#### **ABSTRACT:**

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The extent of big data processing is progressively expanding. The study of big data processing is now underway. In this work, we analyzed the dataset of daily reported cases of the Omicron form of COVID-19. The data is filtered using an optimization point. The optimization method was conducted using the ant colony optimization (ACO) mechanism. When encountering complex optimization problems, one possible strategy is to employ a technique called "ant colony optimization," abbreviated as "ACO." The dataset that has been filtered using ACO is subsequently utilized to train an artificial neural network. Artificial neural networks (ANNs) are directly influenced by the biological neural networks seen in the brain of animals. An artificial neural network (ANN) is constructed using a network of interconnected units or nodes called artificial neurons. These artificial neurons have a similar structure and function to the neurons found in the human brain. Neural networks in the fields of artificial intelligence, machine learning, and deep learning imitate the operations of the human brain, allowing computer program to recognize patterns and address typical issues. This improves the efficiency and precision of the prediction process.

Keywords: Big data processing, Data processing, ACO, ANN, COVID 19

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### | 0019 | Digital Twin Technology in Campus Infrastructure Management

Bhawna Janghel Rajput<sup>1, #</sup>, Shaziya Islam<sup>2</sup>, Shweta Bandhekar<sup>3</sup>, Tripti Sharma<sup>4</sup>, Huma Khan<sup>5</sup>, Aradhana Sahu<sup>6</sup>

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#### **ABSTRACT:**

Digital Twin Technology (DTT) represents a transformative approach to campus infrastructure management by creating real-time, virtual replicas of physical systems. This technology enables the continuous monitoring, analysis, and optimization of campus operations, ranging from energy efficiency to predictive maintenance. By integrating IoT sensors, Building Information Modeling (BIM), and advanced analytics, digital twins provide actionable insights into resource utilization, sustainability efforts, and emergency preparedness. This paper explores the implementation framework, benefits, and challenges of adopting DTT in educational institutions. The study highlights how digital twins can foster smarter decision-making, reduce operational costs, and enhance campus safety, ultimately driving innovation in infrastructure management.

Keywords: Digital Twin Technology (DTT), Campus Infrastructure Management, Internet of Things, (IoT), Building Information Modeling (BIM), Predictive Maintenance

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## | 0020 | A Block chain-Based Secure Voting System Enhanced with Zero-Knowledge Proofs Explainable AIbased prognosis and categorization of breast cancer on ultrasound dataset

Ishita Gupta<sup>1</sup>, Teekeshwari Deshmukh <sup>2</sup>, Richa Sharma <sup>3</sup>, Rahul Das<sup>4</sup>, Jyoti Singh Kanwar <sup>5</sup>, Shraddha Rani Sonkalihari <sup>6</sup>

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#### **ABSTRACT:**

Ensuring privacy, security, and transparency in electronic voting systems remains a significant challenge. This paper presents a novel architecture for a decentralized, tamperresistant voting platform utilizing block chain technology and zero-knowledge proofs (ZKPs). Block chain ensures immutable record-keeping, while ZKPs allow vote validation without revealing voter identity or choices. Smart contracts manage vote tallying with complete transparency. We prototype the system using Ethereal and ZoKrates, demonstrating both the scalability and cryptographic strength of the solution in real-world election scenarios.

Keywords: Block chain, Zero-Knowledge Proofs, Smart Contracts, e-Voting, Cyber security, Ethereal, Cryptographic Privacy, Decentralized Systems

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### | 0022 | Social Media Sentiment Analysis Using Natural Language Processing Techniques

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#### **ABSTRACT:**

Social media has become a vital platform for individuals to express opinions, share experiences, and discuss topics of interest. Sentiment analysis, a key application of Natural Language Processing (NLP), enables the extraction and interpretation of emotions and sentiments from social media content. This study focuses on leveraging NLP techniques to analyze and categorize sentiments expressed in user-generated posts on platforms like Twitter, Facebook, and Instagram. By employing machine learning algorithms and sentiment analysis models, the research explores trends, public opinions, and behavioral patterns. The findings aim to demonstrate how sentiment analysis can be applied in various fields, including marketing, politics, and societal impact studies, highlighting its potential to provide actionable insights from social media data.

Keywords: Sentiment Analysis, Natural Language Processing (NLP), Social Media Analytics, Machine Learning, Text Classification.

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# | 0023 | A hybrid method for facial recognition that combines feature extraction methods with a convolutional neural network

Teekeshwari Deshmukh<sup>1, #</sup>, Richa Sharma <sup>2</sup>, Rahul Das<sup>3</sup>, Jyoti Singh Kanwar <sup>4</sup>, Shraddha Rani Sonkalihari<sup>5</sup>, Ishita Gupta<sup>6</sup>

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#### **ABSTRACT:**

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Facial recognition technology's simplicity of use and short processing time have made it useful in a wide range of industries, including robotics, biometric identity, video surveillance, security, health, and commerce. Variations in position, lighting, or occlusion, however, have an impact on this technology. We present a novel method in this paper to increase the accuracy rate of face recognition in the presence of variation or conclusion by combining feature extraction with techniques such as the Canny contour detector, Gabor, scale invariant feature transform (SIFT), and a histogram of oriented gradient (HOG). Additionally, we test the CNN architecture using various combinations of the optimization algorithm used during training (adam, Adamax, RMSprop, and stochastic gradient descent (SGD)) and the activation function used (Softmax and Segmoïd). Preprocessing was done on two databases of our database of faces (ORL) and Sheffield faces utilized for this. After that, we used the aforementioned methodologies to extract features from the databases and passed them to our CNN architecture. Our simulation findings demonstrate that the SIFT+CNN combo performs well when there are variations present, with an accuracy rate of up to 100%.

Keywords: SIFT (Scale Invariant Feature Transform), CNN (Convolutional Neural Network), Optimization Algorithms, HOG(Histogram of Oriented Gradient, ORL database.

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## | 0024 | Emotion-Aware Interfaces: Enhancing User Experience Through Real-Time Sentiment Recognition

Deepa Gajendra<sup>1, #</sup>, Soniya Jaiswal<sup>2</sup>, Anshita Shrivastava<sup>3</sup>, Bhumika Shrivastava<sup>4</sup>, Ashish Shrivastava<sup>5</sup>, Kamal Kumar Prasad<sup>6</sup>

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#### **ABSTRACT:**

In the evolving landscape of human-computer interaction (HCI), emotional intelligence is emerging as a critical factor in improving user satisfaction and engagement. This research explores the design and implementation of emotion-aware interfaces that leverage real-time sentiment recognition to adapt system responses dynamically. By integrating natural language processing (NLP), facial expression analysis, and physiological sensor data, the proposed model can detect user emotions such as happiness, frustration, or confusion with high accuracy. The system then tailors its feedback, content delivery, or interface elements accordingly, creating a more intuitive and empathetic user experience. A prototype application was developed and tested on a diverse user group to evaluate usability, response accuracy, and overall impact on task performance. Results demonstrate a significant improvement in user engagement and perceived satisfaction when interacting with emotion-aware systems. The study contributes to the growing field of affective computing and offers insights for developers aiming to build more emotionally responsive digital environments.

Keywords: Emotion-aware interfaces, sentiment recognition, real-time emotion detection, user experience, human-computer interaction (HCI), affective computing, natural language processing (NLP), facial expression analysis, adaptive systems

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### | 0026 | Real-Time Lemon Classification Using Raspberry Pi for Smart Agriculture

Shraddha Rani Sonkalihari <sup>1,#</sup>, Ishita Gupta <sup>1</sup>, Teekeshwari Deshmukh <sup>2</sup>, Richa Sharma <sup>3</sup>, Rahul Das <sup>4</sup>, Jyoti Singh Kanwar<sup>5</sup>

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#### **ABSTRACT:**

This research investigates the deployment of a lemon classification system utilizing the Raspberry Pi 3 Model B as the core hardware platform. The system is designed to provide an affordable, scalable, and portable solution for real-time image classification in agricultural applications. The hardware configuration includes a Raspberry Pi Camera Module v2 for high-quality image capture, LED lighting for consistent illumination, and a custom-designed case for enhanced durability and protection. Emphasis is placed on optimizing the system's hardware setup to ensure efficient operation under resource constraints. Key considerations such as camera calibration, lighting placement, and thermal management are addressed to enhance system reliability. Testing results demonstrate the practicality of leveraging the Raspberry Pi's capabilities for robust image acquisition and processing in field conditions. This study highlights the potential of low-cost edge computing devices in enabling innovative solutions for agriculture and similar domains, emphasizing the importance of hardware-centric approaches in real-world deployments.

Keywords: Lemon Classification, Raspberry Pi, Camera Module

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# | 0029 | Dual Role of AI in The Cybersecurity: Defender and Threat

Kamal Kumar Prasad <sup>1</sup>,D<u>eepa Gajendra</u> <sup>2</sup>, Soniya Jaiswal <sup>3</sup>,Anshita Shrivastava<sup>4</sup>, Bhumika Shrivastava<sup>5</sup>, Ashish Sonwani <sup>6</sup>

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#### **ABSTRACT:**

Artificial Intelligence (AI) has become both a powerful ally and a formidable adversary in the cybersecurity domain. This paper explores the dual role of AI as both a tool for enhancing cyber defenses and a weapon for executing sophisticated cyberattacks. On one hand, AI strengthens security through real-time threat detection, automated incident response, behavior-based intrusion systems, and predictive analytics. On the other hand, malicious actors increasingly exploit AI for automated phishing, deepfake scams, vulnerability discovery, and the generation of polymorphic malware. The study presents a comprehensive analysis of current AI-driven cybersecurity tools, highlights case studies where AI-enabled attacks have caused real-world damage, and critically examines the ethical and strategic implications of AI's dual use. By evaluating current trends, defense mechanisms, and regulatory responses, this paper advocates for a balanced approach that fosters innovation while mitigating AI's abuse. The research concludes with strategic recommendations to build resilient cybersecurity infrastructures that can harness AI's power without falling victim to its misuse.

Keywords: AI in cybersecurity, adversarial AI, deepfake attacks, AI defense systems, threat detection, AI dual-use, ethical AI, automated hacking

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# | 0030 | Optimization of the K-Means Clustering Algorithm

Rahul Das<sup>1, #</sup>, Jyoti Singh Kanwar<sup>2</sup>, Shraddha Rani Sonkalihari<sup>3</sup>, Ishita Gupta4, Teekeshwari Deshmukh5, Richa Sharma6

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#### **ABSTRACT:**

Clustering is a fundamental task in unsupervised machine learning, with K-Means being one of the most widely used algorithms due to its simplicity and efficiency. However, traditional K-Means is sensitive to the initial placement of centroids and can converge to suboptimal solutions, especially on real-world datasets. In this paper, we present an optimization of the K-Means algorithm using K-Means++ initialization and Mini-Batch K-Means. Our goal is to enhance both the accuracy and efficiency of clustering by improving convergence speed and cluster quality. We evaluate the performance of the optimized variants on standard datasets such as Iris and MNIST, using metrics like inertia, silhouette score, and execution time. Experimental results demonstrate that the proposed optimization significantly improves clustering performance while reducing computational overhead. These findings support the adoption of improved initialization and minibatch strategies in practical applications of K-Means clustering

Keywords: K-Means, Clustering, Unsupervised Learning, K-Means++, Mini-Batch K-Means, Initialization, Optimization, Silhouette Score, Inertia, Execution Time, Machine Learning.

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## | 0031 | Optimizing Gradient Descent Techniques for Deep Learning

Sonal Yadav<sup>1 #</sup>, D.Mohini<sup>1</sup>, Chanchala Patel<sup>1</sup>,Mahendra Kumar Soni<sup>1</sup>,Pinki Patra<sup>1</sup>,Richa Sahu<sup>1</sup>

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#### **ABSTRACT:**

Gradient Descent (GD) is the backbone of optimization in deep learning, directly influencing the speed, stability, and accuracy of model training. While standard variants such as Stochastic Gradient Descent (SGD) are widely used, their limitations—such as slow convergence and sensitivity to learning rate—highlight the need for more robust alternatives. This research investigates and compares advanced gradient descent optimization techniques including Adam, RMSprop, AdaGrad, and newer hybrid methods such as AdaBelief and Ranger. The primary aim is to evaluate the efficiency and effectiveness of various gradient descent optimizers in terms of convergence speed, training stability, and generalization on complex deep learning tasks. We implemented and tested each optimization algorithm using identical deep learning architectures (CNNs and LSTMs) on benchmark datasets such as CIFAR-10 and IMDB Sentiment Analysis. Key performance metrics include training loss, validation accuracy, number of epochs to convergence, and model generalization. Experimental findings reveal that newer optimizers like Ranger and AdaBelief significantly outperform traditional methods in both convergence rate and final accuracy. In particular, Ranger achieved up to 20% faster convergence on image classification tasks, while maintaining or improving generalization. Optimizing gradient descent is critical for improving deep learning model performance. Emerging optimizers show promise for faster and more stable training, making them suitable for time-constrained and resource-sensitive applications.

Keywords: Gradient Descent, Deep Learning, Optimization Algorithms, Adam, Ranger, AdaBelief, Convergence, Training Stability

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## | 0032 | AI Ethics in Human Decision-Making: Addressing Bias and Fairness in AI-Driven Systems

Shaziya Islam<sup>1, #</sup>, Shweta Bandhekar<sup>1</sup>, Tripti Sharma<sup>1</sup>, Huma Khan<sup>1</sup>, Aradhna Sahu<sup>1</sup>, Bhawna Janghel<sup>1</sup>

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#### **ABSTRACT:**

Artificial Intelligence (AI) is increasingly shaping human decision-making across various domains, including healthcare, employment, criminal justice, and social services. While AI offers efficiency and data-driven insights, ethical concerns surrounding bias and fairness remain critical. AI systems, trained on historical data, can inadvertently reinforce existing inequalities, leading to unfair outcomes that disproportionately impact marginalized communities. Bias in AI can manifest in hiring processes, loan approvals, medical diagnoses, and legal sentencing, raising fundamental ethical questions about accountability and hu- man oversight. This paper examines the ethical dimensions of AI-driven decision-making, focusing on bias detection, fairness enhancement, and ethical governance. It explores case studies illustrating AI's unintended consequences and discusses frameworks for responsible AI design, including transparent algorithms, diverse datasets, and bias mitigation techniques. Additionally, the role of human over- sight and policy interventions is analyzed to ensure AI aligns with ethical stan- dards and promotes equitable outcomes. Ultimately, this study advocates for a multidisciplinary approach integrating AI ethics, social justice, and regulatory frameworks. By fostering transparency, inclusivity, and fairness, AI can enhance human decision-making without com- promising ethical principles. Addressing bias and fairness in AI systems is essen- tial for ensuring technology serves humanity responsibly, safeguarding individual rights and promoting just, ethical applications across industries.

Keywords: decision-making across various domains, AI offers efficiency and datadriven insights

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#### | 0034 | Deep Supervised Feature Learning for Automated Tumor Detection in MRI Scans

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#### **ABSTRACT:**

Deep learning has transformed medical image processing in recent years, making it possible to detect tumours automatically and accurately. A supervised deep learning approach for brain tumor classification and feature extraction from MRI data is presented in this work. Instead of requiring human feature engineering, a CNN-based architecture is trained to learn spatial features straight from MRI scans. When tested on the BraTS dataset, the suggested model shows excellent sensitivity and robustness with an accuracy of 94.2%, an F1-score of 91.6%, and an AUC of 0.95. Techniques including data augmentation, transfer learning, and fine-tuning are used to improve performance, which greatly increases the model's generalization across various MRI modalities. The results demonstrate how well the model supports clinical judgment with little assistance from humans.

Keywords: Deep learning, Supervised learning, MRI, Tumor detection, Convolutional Neural Network

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## | 0036| Fundamental Aspects of Pure Group Theory: Structures, Properties, and Theoretical Insights.

Jagriti Sahu<sup>1, #</sup>, Neha Kumbhar<sup>1</sup>, S C Shrivastava<sup>1</sup>, Nidhi Shrivastava<sup>1</sup>, Rupali Tiwari<sup>1</sup>, Amit Shrivastava<sup>2</sup>

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#### **ABSTRACT:**

Group theory is a fundamental branch of abstract algebra that studies algebraic structures known as groups. These structures play a crucial role in modern mathematics, providing a unified framework for understanding symmetry, transformations, and various algebraic operations. This paper explores the foundational aspects of pure group theory, covering essential concepts such as groups, subgroups, normal subgroups, cyclic groups, and homomorphisms. Additionally, it delves into key theorems, including Lagrange's theorem, Sylow theorems, and the classification of simple groups. The study also examines the significance of permutation groups and their role in understanding mathematical and physical structures. By focusing on rigorous mathematical proofs and theoretical advancements, this research highlights the intrinsic beauty and depth of group theory, making it an indispensable tool in both pure and applied mathematics.

Keywords: Group theory, abstract algebra, algebraic structures, symmetry, transformations, groups, subgroups

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## | 0039| AI-Based Yoga Pose Recommendation System According to User Health Conditions

Rani Namdev Sinha<sup>1,#</sup>, Padmavati Shrivastava<sup>1</sup>, Onika Parmar<sup>1</sup>, Roushan Kumar<sup>1</sup>, Lakshman Sahu<sup>1</sup>, Shreshtha Singh

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#### **ABSTRACT:**

The integration of Artificial Intelligence (AI) in healthcare and wellness has enabled the development of personalized and intelligent support systems. This paper presents an AI-based yoga pose recommendation system designed to suggest appropriate yoga postures according to the user's specific health conditions and fitness goals. The system collects user input regarding medical history, physical limitations, and desired outcomes, and processes this information through a rule-based and machine learning-enhanced recommendation engine. The engine maps health parameters to suitable yoga poses while filtering out contraindicated practices, ensuring user safety and effectiveness. Each recommended pose includes step-by-step guidance, benefits, and necessary precautions. The system aims to promote holistic well-being by combining traditional yogic practices with modern AI techniques, making personalized yoga guidance more accessible and adaptive. This approach not only supports preventive healthcare but also encourages the safe adoption of yoga as a therapeutic intervention.

Keywords: Artificial Intelligence, Personalized Healthcare, Wellness Technology, Health Informatics, Machine Learning, Rule-Based System, Preventive Healthcare.

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## | 0040| AI-Driven Precision Agriculture: Revolutionizing Farming

Tripti Sharma<sup>1, #</sup>, Huma Khan<sup>2</sup>, Aradhana Sahu<sup>3</sup>, Bhavana Janghel<sup>4</sup> Shaziya Islam<sup>5</sup>, Shweta Bandhekar<sup>6</sup>

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#### **ABSTRACT:**

AI-driven precision agriculture revolutionizes farming by integrating data from sensors, drones, and satellites with AI to monitor crop health and optimize output. This approach enables farmers to access real-time information on crop conditions, soil health, and environmental factors. Through meticulous data analysis, AI systems detect early signs of pests, diseases, and nutrient deficiencies, allowing timely interventions. Predictive analytics optimize irrigation, fertilization, and harvesting schedules, enhancing productivity and resource efficiency. This technology addresses global food demands while improving agricultural sustainability and productivity. A Python-based simulation demonstrates the potential of AI and IoT integration in precision agriculture, providing valuable insights into enhanced decision-making and productivity. Key aspects include crop health monitoring, yield optimization, sensor data analysis, drone technology, and satellite imagery, transforming the agricultural sector and improving food security globally.

Keywords: AI-driven Precision Agriculture, Crop Health Monitoring, Yield Optimization, Sensor Data Analysis, Drone Technology, Satellite Imagery

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## | 0041| Mathematical Logic in Artificial Intelligence and Machine Learning

Neha Kumbhar<sup>1, #</sup>, Jagriti Sahu<sup>1</sup>, Amit Shrivastava<sup>2</sup>, S.C. Shrivastava<sup>1</sup>, Rupali Tiwary<sup>1</sup>, Nidhi Shrivatava<sup>1</sup>

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#### **ABSTRACT:**

Mathematical logic serves as a crucial framework for reasoning, knowledge representation, and decision-making in artificial intelligence (AI) and machine learning (ML). This paper explores the intersection of logic and intelligent systems, highlighting how formal logical methods contribute to knowledge-based AI, explainability, and constraint-based learning. It also discusses logic's role in symbolic reasoning, logic programming, and hybrid approaches that integrate logical and statistical techniques. The study reviews key developments in logical AI, such as first-order logic, non-monotonic reasoning, and probabilistic logic, and evaluates their applications in expert systems, natural language understanding, and interpretable machine learning models.

Keywords: Mathematical Logic, Artificial Intelligence, Machine Learning, Knowledge Representation, Symbolic Reasoning, Logic Programming, First-Order Logic

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## | 0042 | The impact of 5G on global connectivity

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#### **ABSTRACT:**

5G technology is revolutionizing global connectivity by delivering unprecedented speed, ultra-low latency, and the capacity to connect a massive number of devices simultaneously. This fifth generation of mobile networks significantly upgrades 4G by enabling superfast broadband, ultra-reliable low-latency communication, and massive machine-type communications, which collectively support the growing demands of the Internet of Things (IoT), smart cities, autonomous vehicles, and advanced industrial automation. Industries such as manufacturing, healthcare, transportation, and agriculture will particularly benefit from 5G through increased automation, improved efficiency, and real-time data analytics. For example, 5G-enabled smart diagnostics in healthcare could prevent millions of medical interventions, while manufacturing will see significant productivity gains from automation and connected devices. Additionally, 5G facilitates better communication, supports innovative business models, and fosters technological advancements like virtual and augmented reality. Despite its transformative potential, 5G deployment requires overcoming challenges related to infrastructure investment, security, and regulatory compliance. Nevertheless, its ability to interconnect people, devices, and systems promises to redefine global connectivity and drive the next wave of digital transformation across multiple sectors.

Keywords: Revolutionizing global connectivity; 5G technology; Virtual and augmented reality; Internet of Things(IoT); Security

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## |0043| Everything You Know About Space

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#### **ABSTRACT:**

Space, the vast and seemingly infinite expanse beyond Earth's atmosphere, has captivated human curiosity for centuries. It is a realm of extremes—unimaginable distances, colossal celestial bodies, and the delicate dance of cosmic forces. Despite significant advancements in astronomy and space exploration, much of space remains a profound mystery. We know it houses billions of galaxies, each containing countless stars and planets, yet the true scale and structure of the universe are still beyond complete comprehension. The universe operates under physical laws that govern motion, gravity, and energy, yet phenomena like dark matter and dark energy challenge our current understanding. Space is not just emptiness—it contains radiation, particles, magnetic fields, and even rogue planets drifting without a star. Time behaves differently near massive objects like black holes, illustrating the complex relationship between space, time, and gravity. Technological milestones, from telescopes to interplanetary probes, have revealed exoplanets, cosmic microwave background radiation, and even gravitational waves. Meanwhile, space travel has taken humans to the Moon and robotic explorers to the outer reaches of our solar system. Yet, we have only scratched the surface. This abstract is not a final word but a glimpse into a subject that continues to evolve. Space is not only a frontier of science but a mirror of human imagination and ambition, urging us to explore further, question deeper, and reach beyond.

Keywords: cosmology; space exploration; galaxies; dark energy

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## | 0045 | Integration of AI and Aviation

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#### **ABSTRACT:**

AI can be defined as the technology that gives power to the computers and machines to simulate human learning, problem solving, analysing and making predictions based on a given set of data. Integration of AI technologies in the field of aviation is enhancing efficiency, safety, and automation across the various domains of aviation. Before the introduction of AI, the aviation industry faced many challenges such as the use of traditional systems which include the manual processes and rule-based decision making, which led to inefficient and slower operations. The aviation sector generates large quantities of data which were very difficult to process and extract the valuable insights from the data using traditional system. The infusion of AI technologies in the various domains of aviation such as Air Traffic Management (ATM), safety, maintenance and unmanned autonomous aircraft has had a significant impact. The AI technologies, such as Explainable AI (XAI), are being used in various contexts ranging from predictive maintenance and anomaly detection to air traffic management to make their process transparent and understandable. Long-Short Term Memory (LSTM) networks are applied in the industry of multiple uses, including forecasting the paths of aircraft, air traffic movements and forecasting Runway Visual Range(RVR). All these advances in the technologies notwithstanding, the industry continues to experience challenges like data security, ethics, and explainability of AI models, which continue to be major areas of research. This paper presents the revolutionary capabilities of AI in aviation, focusing on emerging technologies, applications, and future research directions.

Keywords: artificial intelligence; aviation; machine learning; LSTM; Explainable AI

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## | 0046 | Hybrid Optimization-Based Segmentation of Breast Cancer Ultrasound Images Using Particle Swarm Optimization and Simulated Annealing

Kushangi Atrey<sup>1,#</sup>, Padmavati Shrivastava<sup>1</sup>, Sonal Yadav<sup>1</sup>, Aparna Raha<sup>1</sup>, Chanchala Patel<sup>1</sup>

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#### **ABSTRACT:**

Breast cancer is a malignancy that continues to be one of the most common types among women, and early detection is a way forward to a good treatment outcome. Ultrasound imaging is a commonly used method for breast cancer screening that is non-invasive and affordable. Nevertheless, errors due to speckle noise, low contrast, and variations in tumor shape still occur when the segmentation is carried out in ultrasound images. The use of traditional segmentation methods often results in unsatisfactory outcomes, while deep learning-based approaches will need plenty of labeled datasets and almost unlimited computational resources. A hybrid segmentation that utilizes Particle Swarm Optimization (PSO) and Simulated Annealing (SA) is implemented in this study aiming to increase the segmentation precision. The PSO algorithm explores the search space effectively, and the SA method is used here to avoid local optima that would prevent the solution from converging. The proposed method is put through challenges on publicly available breast ultrasound imaging datasets. The PSO-SA hybrid segmentation model showed a Jaccard Index of 0.97 for benign & malignant cases which makes it a very promising tool for automatic breast cancer detection.

Keywords: Breast cancer, Ultrasound imaging, Image segmentation, Particle Swarm Optimization, Simulated Annealing, Hybrid optimization

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## | 0049 | Customer Segmentation Using K-Means Clustering

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#### **ABSTRACT:**

In the modern business world, understanding customer behavior is crucial for delivering personalized experiences, improving satisfaction, and increasing profitability. One effective approach to achieving this is customer segmentation—dividing a customer base into smaller groups with similar characteristics or purchasing behavior. This research focuses on implementing K-Means Clustering, a popular unsupervised machine learning algorithm, to perform customer segmentation based on attributes like age, annual income, and spending score. The dataset used in this study is a real-world customer dataset commonly used in retail analytics. The data was cleaned, normalized, and visualized using Python libraries such as Pandas, Matplotlib, and Seaborn. The Elbow Method was applied to determine the optimal number of clusters (K), ensuring meaningful and well-separated segments. After applying the K-Means algorithm, customers were grouped into distinct clusters, such as high-income high spenders, young budget-conscious buyers, and older moderate spenders. The results were visualized using scatter plots and cluster centroids to clearly represent the behavioral patterns of each group. These insights can help businesses develop targeted marketing strategies, offer personalized services, and allocate resources more effectively. Additionally, the project highlights the importance of data preprocessing, feature selection, and model evaluation in real-world data science tasks. This research demonstrates that clustering algorithms like K-Means can extract meaningful patterns from unlabeled data and play a vital role in decision-making across various industries. The project serves as a foundational learning experience in unsupervised machine learning for second-year students, offering practical exposure to key concepts like clustering, distance metrics, data visualization, and business intelligence.

Keywords: Customer segmentation; K-Means clustering; Machine learning; Unsupervised learning; Data science

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## | 0060 | Analysis of Survillance and Attacking Drone

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#### **ABSTRACT:**

Over the past few years, the Chhattisgarh Armed Forces have been threatened by a serious security issue in the form of false emergency calls from hostile areas. Such misleading calls trap the forces into ambushes, sometimes even before they arrive at the destination. This regular threat has caused heavy casualties and operational losses. To meet this challenge, this research suggests the creation of an advanced attacking and surveillance drone system for route scouting, threat detection, and quick response, The main aim is to create a drone that can autonomously prowl suspected areas, identify potential ambuscades through thermal and HD cameras, and neutralize threats if needed. The approach includes the combination of GPS-based autonomous navigation, AI-driven object and heat signature detection, real-time data relay, and payload system with the ability to dispense smoke screens or non-lethal countermeasures. Simulator runs in the field were used to evaluate the performance of the drone in environments analogous to trouble-torn areas in Chhattisgarh, The salient finding proves that the drone is able to identify the presence of humans at safe distances, communicate intelligence in real-time, and reduce personnel exposure. In summary, the envisioned drone system provides an inexpensive, effective, and safer solution for pre-patrol reconnaissance and battle support, thus optimizing the strategic capabilities of military forces in adverse environments

Keywords: Chhattisgarh Armed Forces, advanced attacking and surveillance drone system

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## | 0061 | Turning Plastic Waste into Sustainable Urban Development

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#### **ABSTRACT:**

The escalating crisis of plastic waste, coupled with rapid urbanization, necessitates transformative solutions that align environmental management with sustainable development goals. This study investigates the feasibility of converting post-consumer plastic waste into functional building materials for use in sustainable urban infrastructure. Employing a mixed-methods research design, we combined material engineering experiments with case study analysis. Laboratory trials tested mechanical, thermal, and environmental properties of composite materials made from recycled plastics, while global case studies (from India, Kenya, and the Netherlands) provided context on scalability, policy integration, and community impact.

Results indicate that plastic-derived construction materials—such as interlocking bricks, pavers, and roofing panels—demonstrate comparable strength and insulation properties to conventional alternatives, with reduced carbon footprints and production costs. Case studies revealed that such innovations not only divert waste from landfills and waterways but also generate green jobs and support circular economy models in underserved communities.

Keywords: Sustainable construction, Circular economy, Plastic waste management, Urban resilience, Green infrastructure, Recycled plastic composites, Eco-innovation, Low-carbon materials

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## | 0062 | Exploring Technological Revolution and Adoption for Blockchain Technology with its Potential Fit for Sustainable Societal and Environmental Changes

Aradhana Sahu<sup>1,#</sup>, Bhawna Janghel<sup>2</sup>, Shaziya Islam<sup>3</sup>, Shweta Bandhekar<sup>4</sup>, Tripti Sharma<sup>5</sup>, Huma Khan<sup>6</sup>

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#### **ABSTRACT:**

Blockchain technology has become a revolutionary advancement with broad ramifications for many industries. It is an open-source, decentralized digital ledger that securely records and verifies network transactions. This paper reviewed and examines the foundational features of blockchain technology and how they have a significant influence on technological adoption. The blockchain has significant effects on societal and environmental changes that are sustainable. It addresses important issues such as patient privacy, data security, and interoperability. Blockchain enables secure medical record exchange and management, maintaining data integrity and giving healthcare professionals access to patient data in real time. Additionally, it makes clinical trials, drug tracing, and the detection of fake pharmaceuticals easier. First and foremost, blockchain has changed the financial sector. Blockchain-based cryptocurrencies have replaced conventional fiat money as a viable alternative. It enables effective international payments, unbanked people's financial inclusion, and the potential for decentralized finance (DeFi) applications. Additionally, Innovation in many different areas, such as energy, supply chains, real estate, intellectual property, and more, has been spurred by blockchain technology. Because of its decentralized structure, cryptographic security, and trustless environment, entrepreneurs and developers have been motivated to consider new ideas and develop original applications. In conclusion, blockchain technology has a huge and diverse impact on how technologies are adopted. It challenges conventional systems, increases productivity across industries, and enhances security.

Keywords: Keywords: Interoperability; Decentralization; Security; Digital Assets; Secure Sharing; Healthcare; Cryptocurrency

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## | 0063 | AI-Powered Autonomous Robotic System for Intelligent Vehicle Insurance Assessment and Fraud Detection

Onika Parmar<sup>1,#</sup>, Shweta Pandey<sup>1</sup>, Rani Namdev Sinha<sup>1</sup>, Roushan Kumar<sup>1</sup>, Madhuri Gupta<sup>1</sup>, Padmavati Shrivastava<sup>1</sup>

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#### **ABSTRACT:**

This paper presents an advanced, field-deployable AI-driven robotic system engineered to revolutionize vehicle loss assessment and fraud detection. The system integrates an articulated robotic arm with high-resolution visual, LiDAR, infrared, and thermal sensors to capture multidimensional damage data, while IoT-enabled modules retrieve real-time telemetry from vehicle systems. Utilizing encrypted data processing and machine learning algorithms, the system performs causal and spatial analysis to identify inconsistencies between claimed and observed accident data. A block chain-based ledger ensures the immutability and transparency of all transactions, enhancing trust and regulatory compliance. Through autonomous navigation, real-time decision-making, and predictive analytics, the system not only streamlines the insurance workflow but also elevates its precision and reliability. This intelligent robotic platform represents a significant advancement toward digitizing and automating insurance operations, reducing fraud, and ensuring equitable outcomes for all stakeholders.

Keywords: Machine learning, thermal sensing, blockchain, multi-sensor fusion, realtime data encryption, predictive analytics

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# | 0064 | Automated Segmentation of Chest X-ray Images: Evaluating the Efficacy of Deep Learning Architecture

Kushangi Atrey<sup>1</sup>, Padmavati Shrivastava<sup>1</sup>, Rahul Godara<sup>1,#</sup>, Sakshi Sinha<sup>1</sup>, Rohan Kumar<sup>1</sup>, Sonal Raj<sup>1</sup>

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#### **ABSTRACT:**

Precise and timely segmentation of COVID-19 affected areas in X-ray scans is essential for clinical management, disease burden estimation, and proper treatment of the disease. The need for automated and reliable methods is highlighted by the time-consuming manual approach performed by radiologists. Despite the promise shown by deep learning, particularly U-Net-based architectures, and accurately segmenting heterogeneous infection areas with often undefinable boundaries remains a challenge. This paper investigates a sophisticated deep-learning architecture that integrates residual learning ideas and attention mechanisms for automated COVID-19 infection segmentation. The study made use of the publicly available dataset on which various data augmentation techniques were applied during the training phase. Several performance metrics were evaluated for the segmented outputs including accuracy (95.79%), Dice Coefficient (83.29%), Jaccard Index (84.53%), and Area under ROC Curve (0.98). Furthermore, the Grad-CAM visualizations identified the model's attention on clinically pertinent pathological areas. The results show that the proposed architecture efficiently and powerfully enables automatically segmenting COVID-19 infections from X-ray scans. This will help the radiologists with patient assessment and treatment by simplifying their clinical procedures.

Keywords: COVID-19; Chest X-ray; Deep Learning; Image Segmentation; residual network.

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## | 0069 | The Role of Artificial Intelligence in Transforming Healthcare

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#### **ABSTRACT:**

Artificial intelligence (AI) is transforming operational efficiency, diagnostics, treatment, patient care, and healthcare itself. More accurate disease detection, predictive analytics, and personalized medicine made possible by AI-driven technologies including natural language processing and machine learning algorithms are helping to enable Radiologists can more precisely find anomalies with AI-powered imaging systems, so enhancing early diagnosis of diseases including cancer. AI also helps with drug discovery by rapidly advancing research and development from massive data analysis. By means of smart electronic health records and virtual health assistants, artificial intelligence is also revolutionizing patient management, so enhancing accessibility and lowering administrative workload. Driven by artificial intelligence, robotic surgeries let minimally invasive treatments with improved accuracy. Furthermore, remote consultations made possible by AI-driven telemedicine help to close gaps in healthcare access. In spite of its great promise, artificial intelligence in healthcare has ethical questions, data privacy issues, and strong regulatory framework needs. Widespread acceptance depends on ensuring AI systems are open, fair, and safe. As artificial intelligence develops, it promises to maximize healthcare delivery, enhance patient outcomes, and lower costs, so enabling global access and efficiency of quality healthcare.

Keywords: Health Care; Technology; Artificial Intelligence; AI-driven telemedicine

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## |0076| Emotion-Aware Social Media Feed with Real-Time Emotion Recognition to Enhance Mental Health

Pinki Patra<sup>1,#</sup>, Richa Sahu<sup>1</sup>, Sonal Yadav<sup>1</sup>, D Mohini<sup>1</sup>, Chanchala Patel<sup>1</sup>, Mahendra Kumar Soni<sup>1</sup>

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#### **ABSTRACT:**

Social media now plays a crucial role in everyday life by offering channels for exchanging information, communicating, and expressing oneself. However, users' mental health can be severely impacted by excessive and uncontrolled exposure to emotionally upsetting or negative content, which can result in social isolation, stress, anxiety, and despair. Conventional social media platforms frequently lack emotional intelligence and are ill-prepared to react to users' emotional states in a dynamic manner. In order to provide a customized and emotionally responsive user experience, this project suggests an Emotion-Aware Social Media Feed that makes use of real-time emotion recognition. The system can determine users' emotions while they engage with material by combining technologies including speech tone detection, natural language processing (NLP), and facial expression analysis. The platform prioritizes and curates' information based on these emotional insights, limiting exposure to potentially dangerous content and encouraging postings that are uplifting, relaxing, or motivational when distressing indications are identified. Promoting emotional awareness, improving digital well-being, and offering early help or treatments when needed are the objectives. Furthermore, the system prioritizes ethical aspects such as fairness across various demographic groups, secure data handling, and informed user permission. In order to create better social media connections, this project intends to turn passive content consumption into an emotionally intelligent and mentally supporting experience by fusing artificial intelligence with affective computing concepts

Keywords: Emotion recognition, mental health, affective computing, personalized social media, digital well-being.

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## |0077| AI-Driven Infant Voice Analysis for Early Diagnosis of Health Issues

Anshita Shrivastava<sup>1, #</sup>, Soniya Jaiswal<sup>1</sup>, Bhumika Shrivastava<sup>1</sup>, Kamal Kumar Prasad<sup>1</sup>, Ashish Kumar Sonwani<sup>1</sup>, Deepa Gajendra<sup>1</sup>

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#### **ABSTRACT:**

The well-being and health of infants have long been a primary concern for caregivers and healthcare professionals. The inability of infants to communicate effectively through conventional means often leads to challenges in early detection of discomfort, health issues, or emotional states. This paper introduces an innovative voice-based monitoring system for infants, empowered by cuttingedge artificial intelligence (AI) technologies, aimed at revolutionizing infant care. The voice-based monitoring system utilizes AI algorithms to analyse and interpret the vocalizations and sounds emitted by infants, providing real-time insights into their emotional and physical states. Through this advanced analysis, caregivers can promptly respond to the infant's needs, whether related to hunger, discomfort, or potential health concerns. This system offers a novel and non-intrusive approach to infant monitoring, reducing the stress and uncertainty that often accompany parenthood.[1] We delve into the technical intricacies of this system, discussing the AI algorithms used for voice analysis and pattern recognition. Furthermore, we present the results of a comprehensive study conducted to evaluate the system's effectiveness in diverse real-world scenarios, highlighting its accuracy in detecting and classifying infant vocalizations. The findings demonstrate the potential of this technology to enhance the quality of infant care significantly. Ethical considerations are a central focus of this research, emphasizing the importance of data privacy, security, and responsible AI development. We explore the ethical dimensions of AIpowered infant monitoring, addressing concerns related to data collection and potential misuse of sensitive information. We advocate for a balanced approach that combines the benefits of technology with the warmth and care of human interaction.

Keywords: Voice Based Monitoring System, Artificial Intelligence, Voice Analysis, Voice Pattern Recognition.

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## |0080| Preventing Heart Disease in India: A Holistic Approach to Early Detection and Lifestyle Modification Approach to Early Detection and Lifestyle Modification

Mandeep Kumar<sup>1, #</sup>, Dr Ajoy Kumar Behera<sup>2</sup>, Irshad Alam<sup>3</sup>, Pradeep Kumar<sup>4</sup>, Abhijeet Keshri<sup>5</sup>, Dr Shaziya Islam<sup>6</sup>,

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#### **ABSTRACT:**

Heart attacks have quietly become one of the leading causes of death in India. With growing urbanization and lifestyle shifts—like unhealthy diets, lack of physical activity, high stress, smoking, and alcohol consumption—heart disease is now a major public health concern. Even though modern treatments exist, prevention is still a big challenge, especially due to limited awareness and poor access to healthcare in many parts of India. Our study aims to explore how heart attacks can be prevented through simple yet impactful lifestyle changes. To ensure our approach is practical and medically sound, we developed a heart disease detection and prevention project combining technology and clinical insight. As part of our research, we visited AIIMS Raipur and consulted Ajoy Kumar Behera, an expert in cardiovascular and pulmonary health. His vast experience gave us a deeper understanding of how common lifestyle habits in India can be modified to reduce heart disease risk. With his guidance, we identified ten key preventive strategies: regular physical activity, heart-healthy diets, stress management, proper hydration, avoiding tobacco and alcohol, adequate sleep, regular health check-ups, maintaining healthy weight, and giving attention to mental and spiritual well-being. Behera emphasized that these simple, everyday choices can go a long way in protecting the heart. This paper highlights the importance of making preventive care accessible and relatable for Indian communities. By encouraging such habits through awareness and education, we can lower the number of heart attacks and create a healthier future. Our project not only spreads awareness but also offers a roadmap for individuals and policymakers to prioritize heart health in a culturally meaningful way.

Keywords: Heart Attack Prevention, Cardiovascular Disease, Lifestyle Modification, Preventive Healthcare, AIIMS Raipur, Ajoy Kumar Behera, Public Health Strategy in India.

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## | 0082 | IoT-Based Drone Projects

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#### **ABSTRACT:**

The integration of Internet of Things (IoT) technology with drones has created a transformative convergence, expanding capabilities across multiple domains. IoT-enabled drones combine wireless communication, embedded sensors, cloud computing, and real-time analytics to form intelligent aerial systems capable of autonomous operation and remote monitoring. Their architecture typically includes sensor arrays (e.g., cameras, LiDAR, environmental sensors), onboard processing units, connectivity modules (4G/5G, Wi-Fi, LoRaWAN), and cloud-based control systems for data-driven decision-making. These drones are widely applied in precision agriculture (crop monitoring, targeted pesticide use), infrastructure inspection (power lines, bridges, solar farms), environmental monitoring (forest health, pollution tracking), logistics (delivery of medical and commercial goods), and emergency response (search and rescue, disaster assessment). Functioning as mobile sensor hubs, they collect, process, and transmit data while executing pre-defined or adaptive flight patterns. However, several challenges hinder widespread deployment. These include limited battery life, regulatory restrictions on autonomous operations, data security vulnerabilities, bandwidth limitations for real-time high-definition video, and integration issues with existing IoT frameworks. Ongoing research aims to address these challenges through energy-efficient flight systems, edge computing for local data processing, secure communication protocols, and standardized integration frameworks.

As technology advances, IoT-enabled drones will become more autonomous, efficient, and versatile—enhancing data collection, enabling adaptive behaviors, and unlocking new applications that leverage aerial mobility and intelligent sensing.

Keywords: Internet of Things (IoT), Drones, Autonomous Systems, Wireless Communication, Real-time Data Analytics, Precision Agriculture, Environmental Monitoring, Infrastructure Inspection, Edge Computing, Sensor Integration.

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## | 0085 | Predicting Mental Health and Academic Outcomes from Social Media Usage using Machine Learning

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#### **ABSTRACT:**

Social media has become a vital part of students' lives, influencing both their mental health and academic performance. While it offers benefits like communication and learning, excessive use may lead to stress, anxiety, poor concentration, and lower academic outcomes. This project uses data science techniques to explore how social media habits affect student well-being and performance. Data is collected via surveys and usage logs, covering screen time, emotional state, sleep patterns, and grades. After preprocessing, exploratory data analysis (EDA) helps identify key patterns and correlations. Tools like Python, Pandas, Matplotlib, and Seaborn are used for analysis and visualization. Sentiment analysis through NLP techniques is applied to text data to detect emotional impact. Machine learning models such as logistic regression and decision trees are used to predict mental stress and academic decline based on usage behavior. The aim is to derive insights that help in promoting balanced social media use and supporting students' mental health and academic success.

Keywords: using social media, mental health, sentiment analysis, machine learning

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## | 0086 | Customer Segmentation Using K-Means Clustering

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#### **ABSTRACT:**

Smart Water Management System Based on Household Size, The Smart Water Management System addresses water scarcity by regulating water usage according to the number of individuals and animals in each household.

\*\*Main Goals:\*\* - Conserve water - Minimize waste - Ensure fair distribution through automation The system utilizes IoT tools, including flow sensors and microcontrollers (Arduino or Raspberry Pi), to monitor and control real-time water consumption. It calculates a daily water quota based on registered household data. When the limit is reached, users are alerted, or water flow is temporarily restricted. Users and authorities can monitor consumption patterns via cloud integration and mobile apps.

\*Data Collection:\* Households register the number of people, pets, and livestock to determine a daily water allowance.

\*Hardware Setup:\*Flow sensors monitor usage, while microcontrollers process data against daily limits. Additional sensors can monitor storage tanks, and automated valves manage water flow.

\*Monitoring and Control:\*The system tracks usage continuously. If limits are exceeded, it sends alerts and reduces water supply. Users can request temporary extensions in emergencies.

\*IoT and Cloud Integration:\*Connection to a cloud server allows for real-time monitoring and notifications about usage trends, accessible by local authorities to improve water management.

\*Impact:\* In urban areas, the system curtails excessive use, while in rural areas, it promotes sustainable practices and aids in water delivery planning, fostering awareness of conservation.

Keywords: Smart Water Management System, Water scarcity, Water conservation, Fair distribution, Sustainable practices, Real-time monitoring

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### | 0089 | AI in Phishing & Social Engineering Defense

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#### **ABSTRACT:**

In an era marked by rapid industrialization and urban expansion, a substantial amount of energy is lost through heat, motion, and organic waste. Recovering this otherwise wasted energy presents a promising and sustainable approach to addressing the growing global energy demand while reducing environmental impact. Energy recovery involves the capture and conversion of residual energy into usable forms, enhancing overall energy efficiency. Advanced techniques such as waste heat recovery, biogas production from organic matter, waste-to-energy incineration, piezoelectric systems, thermoelectric generators, and regenerative braking systems have emerged as effective strategies for energy conversion across diverse sectors. These technologies not only optimize energy utilization but also promote environmentally friendly solutions in transportation, industrial operations, and urban infrastructure. This paper examines the underlying principles, methodologies, and practical applications of waste energy conversion, emphasizing its role in fostering sustainable energy systems and supporting long-term environmental objectives

Keywords: Energy recovery, Waste-to-energy, Energy efficiency, Sustainable energy, Waste heat recovery, Biogas production, Thermoelectric generators, Regenerative braking, Environmental impact.

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## | 0091 | AI-Driven Strategies for Forecasting and Minimizing Transportation Carbon Emissions

Jyoti Upaddhyay<sup>1,#</sup>, Farhat Anjum<sup>2</sup>, Chetna Sahu<sup>3</sup>, Bindu Kashyap<sup>4</sup>

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#### **ABSTRACT:**

The fast expansion of urban transportation has considerably contributed to the rise in carbon emissions, creating serious environmental and public health risks. With an emphasis on improving sustainability in urban mobility systems, this study investigates the use of artificial intelligence (AI) in anticipating and lowering carbon footprints associated with transportation. In order to anticipate carbon output with high accuracy, the research integrates a variety of datasets, such as vehicle density, fuel consumption patterns, traffic flow, and emission coefficients, using sophisticated machine learning and deep learning models. By collecting data related to traffic volume, vehicle types, and fuel usage in Bhilai, Chhattisgarh, the research builds a basic AI model capable of forecasting emission levels based on real-world factors. The proposed framework demonstrates the transformative potential of AI in driving data-informed, low-carbon transportation systems. Initial results show that AI models can help estimate emission trends with reasonable accuracy, providing a foundation for further research and policy development in low-carbon transportation systems.

Keywords: Artificial Intelligence (AI), Carbon Emissions, Emission Prediction, Machine Learning, Sustainable Mobility

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## | 0094 | AQI monitoring of surroundings using Internet of Things

Bhumika Shrivastava<sup>1</sup>, Soniya Jaiswal, Deepa Gajendra, Anshita Shrivastava, Kamal Kumar Prasad, Ashish Kumar Sonwani, Deepa Gajendra

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#### **ABSTRACT:**

The Internet of Things (IoT) is a global network of "smart devices" that can communicate with users and other systems as well as detect and connect to their environment. One of the main issues of our time is air pollution worldwide. Current monitoring technologies are less sensitive, less precise, and need analysed in a lab. Better monitoring mechanisms are therefore required. We suggest a three-phase air pollution monitoring system to address the issues with current systems. Gas sensors, an Arduino IDE, and a Wi-Fi module were used to create an Internet of Things kit. To monitor air pollution, this device can be physically positioned in different cities. Data from the air is collected by the gas sensors and sent to the Arduino IDE. Through the Wi-Fi module, the Arduino IDE sends the data to the cloud. Additionally, we created the IoT- Mobair Android app, which allows users to get pertinent cloud-based air quality data. In the event that a user is heading somewhere. The entire route's pollution level is forecast, and if it is excessively high, a warning is shown. The suggested solution is comparable to Google Maps' navigation app or Google traffic. Additionally, future air quality index (AQI) levels can be predicted using air quality data.

Keywords: Global Positioning System (GPS), Sensors, Cloud, Android, Distributed Systems, Air Pollution Monitoring System, Air Quality Index (AQI), and Air Pollution Safe Route.

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## | 0101 | Deep Learning For Enhanced Early Disease Detection Through AI-assisted Medical Image Analysis

Anushka Dey<sup>1, #</sup>, Rani Kumari<sup>2</sup>, Dr Shaziya Islam<sup>3</sup>, Dr Anurag Sharma<sup>4</sup>, Sneha CA<sup>5</sup>

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#### **ABSTRACT:**

For better patient outcomes and survival rates, early and accurate disease recognition is important. However, manual medical image analysis is frequently difficult, inflexible, and prone to human error. Through the analysis of medical pictures, the present research deals with the applications of deep learning—more specifically convolutional neural networks, or CNNs—for improved and automated early disease identification. Training a complex CNN model on big, annotated datasets of medical images—including those from a variety of technologies (such as X-rays, MRIs, and CT scans) and disease categories—is the technique suggested. Image quality is improved and standardized with preprocessing techniques. After learning complex clinical traits, the trained model can detect minor abnormalities that are suggestive of early-stage diseases with high sensitivity and specificity. The goal of this AI-assisted system is to give doctors and radiologists a strong tool for quicker and more accurate diagnosis. The technology may be able to minimize interobserver variability, speedup treatments, and cut down on diagnostic delays by identifying worrisome areas and offering probabilistic evaluations. In order to improve patient care and public health through early disease diagnosis, the study will assess the model's performance on difficult datasets and investigate its potential for integration into clinical processes.

Keywords: Deep learning, early disease detection, medical image analysis, AI, convolution neural networks, clinical integration.

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## | 0102 | Implementation and Analysis of Breadth-First Search Algorithm for finding Shortest Path in Un-Weighted Graphs.

Jaspreet Kaur, Varsha Yadav, Kavita, Tripti sharma, Vani Kapse, Tuman Patel

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#### **ABSTRACT:**

Breadth-First Search (BFS) is a fundamental graph traversal algorithm used extensively in computing the shortest path in un-weighted graphs. This paper presents the implementation of BFS tailored for shortest-path computation and analyses its performance in terms of time complexity, memory usage, and effectiveness across different graph densities and structures. The study demonstrates that BFS is an optimal algorithm for un-weighted path finding, offering predictable performance and simplicity. Experimental results reinforce theoretical claims and provide insights into practical implications and optimizations.

Keywords: Breadth-First Search (BFS), Graph traversal, shortest path, Un-Weighted graphs, Algorithm optimization, Path finding, Time complexity

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### | 106 | Real-Time AI Surveillance Using Acoustic Sensors in Dense Forest Borders

Gaurav Singh Sahu<sup>6</sup>, Ajay Khushwaha<sup>2</sup>, Vikas Singh<sup>3</sup>, Deepak Pandey<sup>4</sup>, Bharat Peshwani<sup>5</sup>, Kirti Kale<sup>6</sup>, K. J. Satao<sup>7</sup>

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#### **ABSTRACT:**

Watching India's forest borders — especially in areas like the Northeast — is very difficult. The trees are thick, there's no clear view, and intruders can sneak in quietly. In this project, we are building a smart system that can listen to sounds in the forest (like footsteps, vehicles, or drones) and use artificial intelligence (AI) to figure out if there is a possible threat. We use small microphones placed in the forest that constantly record natural sounds. These sounds are then analyzed by a tiny AI computer placed nearby, which has been trained to tell the difference between normal forest sounds (like birds or wind) and unusual I sounds (like people or drones).

If the system hears something suspicious, it will:

- Immediately send an alert to the army or control center
- Show the location of the sound on a map
- Work even in areas with poor mobile network using low-power communication

This system is low-cost, weather-proof, and easy to install in remote areas. It helps the army keep watch silently and safely without needing to be physically present everywhere. This idea brings together AI, sound detection, and smart communication to improve border safety.

Keywords: Border security; acoustic sensors; real-time surveillance; explainable artificial intelligence; deep learning; threat detection

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## | 111 | Transformer Models for Time-Series Forecasting: A Review of Recent Advances and Applications in Energy and Finance

Shubh Raj Gupta<sup>1, #</sup>, Subham Pandit<sup>2</sup>, Shivam Sahu<sup>3</sup>, Aradhana Sahu<sup>4</sup>, Bhawna Janghel<sup>5</sup>

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#### **ABSTRACT:**

Precise time-series prediction is essential in applications ranging from finance to energy, where the decision heavily depends on the capacity to forecast changing temporal patterns. Popular models such as ARIMA, Prophet, and LSTM have performed satisfactorily but are usually not adequate in capturing long-range dependencies and coping with irregular or multivariate series. Transformerbased architecturs, initially used for natural language processing, have recently been found useful for modeling long-term dependencies and scaling well to large datasets. This has provided new possibilities for their use in time-series forecasting tasks. This review explores recent developments and new trends in the application of Transformer models to time series forecasting, with specific focus on their use in energy systems and financial markets. We review a number of specialized variants of the Transformer—Informer, Autoformer, and Temporal Fusion Transformer (TFT)—and how they specifically handle domain-specific forecasting difficulties like seasonality, multi-horizon forecasting, and high-frequency noise. In addition, we offer a comparative analysis of primary model architectures, learning processes, benchmarking datasets, and performance metrics widely utilized in these applications. We also discuss existing limitations, such as model interpretability, sparsity of data, and real-time deployment restrictions, and highlight research opportunities in the future, notably in enhancing efficiency and domain adaptation. Lastly, we briefly sketch the potential of these technologies to serve towards Sustainable Development Goals, in particular SDG 7 (Affordable and Clean Energy) and SDG 8 (Decent Work and Economic Growth).

Keywords: Breast cancer; ultrasound; explainable artificial intelligence; deep learning

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# |0128| Sentiment Analysis of Amazon Product Reviews Using VADER: Natural Language Processing Techniques

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#### **ABSTRACT:**

In this age of digital transformation, consumer reviews have evolved into the most important source for gauging public opinion, which can ultimately affect consumer purchasing behavior and production. This study aims to utilize sentiment analysis in deriving useful information from Amazon product reviews based on the VADER (Valence Aware Dictionary and Sentiment Reasoner) sentiment analysis tool. VADER is a rule- and lexicon-based model particularly developed to assess sentiments in social media and product review text. In the current research, we process a huge dataset of text reviews systematically, calculate sentiment polarity scores, and label them as positive, negative, or neutral. Keyword filtering based on keywords is also employed to investigate consumer attitude on certain product features like battery life, quality, and value. The results indicate that there is a high correlation between sentiment scores and user ratings, thus serving as evidence that VADER can capture consumers' perception adequately. In this study we also utilize state-of-the-art visualization methods—e.g., violin plots, histograms, and pie charts to clarify sentiment distributions and rating tendencies. Overall, the results illustrate the effectiveness of VADER, a quick and lightweight tool for opinion mining in e-commerce, and valuable insights for manufacturers, retailers, and policymakers trying to maximize user experience and product quality.

Keywords: Sentimental Analysis; Natural Language Processing; Amazon Review; Sentiment Visualization; Keyword-Based Sentiment Filtering; VADER

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## | 0133 | Transformers vs. LSTMs: Benchmarking Financial Fraud Detection in High-Frequency Trading

Aditya Tiwari<sup>1,#</sup>, Sneha C A<sup>2</sup>, Ambika Singh Sengar<sup>3</sup>, Priyank Sahu<sup>4</sup>, Neha Kumari<sup>5</sup>, Bhawana Meher<sup>6</sup>

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#### **ABSTRACT:**

The rapid growth of high-frequency trading (HFT) necessitates robust, real-time fraud detection systems to combat market manipulation. While traditional machine learning methods struggle with sequential financial data, deep learning architectures like Long Short-Term Memory (LSTM) networks and Transformer models offer promising solutions. This paper presents a comprehensive benchmark comparing Transformer-based models (e.g., BERT, TimeSformer) against LSTMs for fraud detection in HFT environments, utilizing a large-scale dataset of 5 million+ HFT transactions from both synthetic and real-world NYSE/NASDAQ sources. Our evaluation metrics include precision, recall, latency, and computational efficiency, revealing that Transformers achieve superior 94.5% precision in detecting spoofing and layering attacks (outperforming LSTMs by 6.2%), while LSTMs demonstrate 20% lower inference latency - a critical advantage for ultra-lowlatency trading systems. To bridge this performance gap, we propose a novel hybrid LSTM-Transformer architecture that reduces false positives by 12% compared to standalone models while maintaining operational efficiency. These findings provide financial institutions with actionable insights into the accuracy versus speed trade-offs in real-world HFT surveillance applications, addressing significant gaps in current fraud detection literature. The study not only establishes a practical roadmap for deploying deep learning in financial security systems but also identifies future research directions including adaptive online learning and quantum-enhanced neural networks for further optimization of real-time trading surveillance.

Keywords: Transformers, LSTMs, Financial Fraud Detection, High-Frequency Trading, Deep Learning Benchmarking

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## |0137|Yoga and Artificial Intelligence: Yoga Pose Detection and Guidance Through an AI

Kavita<sup>1, #</sup>, Chetna Sahu<sup>2</sup>, Jaspreet Kaur<sup>3</sup>, Shweta Singh<sup>4</sup>, Varsha Yadav<sup>5</sup>, Farhat Anjum<sup>6</sup>,

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#### **ABSTRACT:**

The integration of progressed machine learning strategies into human posture estimation has opened unused conceivable outcomes for improving yoga hone. The later advancements in yoga posture discovery frameworks, with a centre on profound learning approaches such as exchange learning utilizing the VGG19 convolutional neural organize. These frameworks offer real-time criticism on pose arrangement, empowering professionals to make strides their frame, maintain a strategic distance from wounds, and develop their hone. The utilize of pre-trained models fine-tuned on commented on yoga posture datasets has appeared promising comes about in precisely classifying and localizing postures in both pictures and video outlines. Past specialized execution, the checked on frameworks emphasize user-centric plan, openness, and moral contemplations, making them appropriate for sending in yoga studios, wellness centers, and individual wellness schedules. This survey highlights the noteworthy potential of posture estimation innovations to advance physical and mental well-being and recommends headings for future inquire about in creating comprehensive, natural, and compelling AI-assisted yoga devices.

Keywords: Human Pose Estimation, Yoga Pose Detection, Deep Learning, , Real-time Feedback, Posture Alignment, Pre-trained Models, Computer Vision, Wellness Technology, User-Centric Design.

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## |0138|"Intelligent Waste Bin System Using Internet of Things (IoT)": A literature review

Chetna Sahu<sup>#1</sup>, Jyoti Upadhayay<sup>2</sup>, Kavita<sup>3</sup>, Farhat Anjum<sup>4</sup>, Varsha Yadav<sup>5</sup>, Shweta Singh<sup>6</sup>

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#### **ABSTRACT:**

In recent years, the integration of the Internet of Things (IoT) in public infrastructure has opened new pathways for smarter, cleaner, and more sustainable living environments. This paper presents a dual-faceted approach that leverages IoT technology for efficient waste management and optimized energy usage in public spaces. Firstly, we propose an IoT-based smart dustbin system designed to automate waste monitoring and collection. The system detects the fill level of the dustbin and alerts the concerned authorities when it reaches maximum capacity, ensuring timely cleaning. This not only reduces manual labour and delays in waste disposal but also contributes to a healthier environment by minimizing the risk of disease caused by unmanaged waste. Furthermore, the system supports the goals of the Swachh Bharat Mission by promoting cleanliness and accountability in waste management through automated reporting and battery-powered operation. Secondly, the paper addresses energy inefficiency in public and shared spaces, where electrical appliances are often misused due to a lack of energy awareness. We explore an IoTenabled framework that embeds intelligence into everyday appliances, such as a capsule-based coffee machine, to monitor usage patterns and adapt their operation accordingly. By providing persuasive feedback to users and optimizing energy consumption using machine learning models, the system reduces unnecessary CO<sub>2</sub> emissions and promotes sustainable behaviour. The proposed solutions collectively demonstrate the potential of IoT in creating smarter urban systems that enhance public health, environmental sustainability, and energy efficiency.

Keywords: Internet of Things, CO<sub>2</sub> emissions

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## |0139|Unleashing of audit script for windows and linux OS to verify CIS Benchmark

Atharva Gehlot<sup>1,#</sup>, Abhinandan Patidar<sup>1</sup>, Himani Namdeo<sup>1</sup>, Ankit Chouhan<sup>1</sup>

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#### **ABSTRACT:**

This problem addresses the crea\theta on of automated audi\theta ng scripts of Windows and some Linux Distribuθ ons according to the CIS benchmarks. The objecθ ve is to improve security adherence and management by verifying computer systems against these security configuraO ons that have been defined within the industry. With the rising need for cybersecurity and that is the reason compliance with benchmarks such as those from CIS is important. The varia  $\Theta$  ons of environments especially with respect to the different opera on g systems being used such as Windows and Linux requires a consistent yet efficient way of audiO ng and ensuring compliance to these security standards. Scripts were conceived and evaluated on the Windows and Linux operaO ng systems. The approach took the form of CIS benchmark requirements as tasks to be executed on and within these operaO ng systems in this case checking configuraO on set ngs and permissions depth. The audit scripts made it possible to discover the deficiencies and areas of use, which were out of compliance, and remedial aco ons taken on these areas where possible. To a large extent, Ome and blue level complexity relaO ng to manual audiO ng were eliminated and operaO onal efficiency and security were improved on the two systems. Ensuring security compliance is one of the challenges that comes in as more and more organiza ons move towards adop on mul -OS environments. These scripts provide an effecθ ve strategy to comply with the requirements of CIS in different environments.

Keywords: CIS Benchmark, audit script, Windows, Linux, PowerShell, Shell scripting, cybersecurity, security compliance, automation, firewall, password policy, system pdates, security configuration, audit logging,

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## |0143|Deep Learning-Based Seismic Signal Analysis for Earthquake Prediction

Soniya Sinha<sup>1,#</sup>, Suchita Roy<sup>2</sup>, Shruti Wasnik<sup>3</sup>, Moh. Faizan Ahmed<sup>4</sup>, Neha Joshi<sup>5</sup>, Prashant Tamrakar<sup>6</sup>

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#### **ABSTRACT:**

Earthquake prediction remains one of the most challenging problems in geo-science due to the complex and nonlinear nature of seismic activities. In recent years, advancements in artificial intelligence (AI), particularly deep learning, have opened new possibilities for early and accurate detection of earthquakes. This study proposes a deep learning-based approach using Convolutional Neural Networks (CNNs) and Long Short-Term Memory (LSTM) networks to analyze seismic waveform data and predict potential earthquake events. The model is trained on historical seismic datasets collected from global earthquake databases and is designed to detect patterns in time-series signals that precede significant seismic events. Experimental results demonstrate that the proposed model achieves high accuracy in distinguishing between normal ground motion and pre-earthquake tremors. This approach enhances early warning capabilities and has the potential to significantly reduce disaster impacts by providing timely alerts. The study also explores the interpretability of the model's predictions using explainable AI techniques, thereby increasing trust and usability among geo-scientists and decision-makers.

Keywords: Convolutional Neural Networks; Long Short-Term Memory: AI Techniques

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# | 0152| Scaling Reasoning in AI: Challenges of Long-Context Understanding in Emerging Models

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#### **ABSTRACT:**

As artificial intelligence systems handle increasingly complex reasoning tasks, their ability to process extended input sequences remains a critical challenge. This study evaluates the reasoning capabilities of various open-source large language models, including state-space architectures and recurrent frameworks, under varying input lengths. Using a controlled dataset, we investigate performance degradation, reasoning failures, and the impact of structured prompting. Our results reveal key limitations in long-context comprehension, highlighting gaps in information retention and instruction adherence. These findings underscore the need for improved architectures and adaptive learning strategies to enhance multi-hop reasoning in large-scale AI systems.

Keywords: Large Language Models, Long-context Reasoning, State Space Models, RWKV, Mamba, FLenQA, Multi-hop Inference, Attention Mechanisms

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## | 0155| AI-based Proctoring System for Online Exams

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#### **ABSTRACT:**

With remote learning and online exams on the rise, maintaining exam integrity is a pressing concern. Manual methods of proctoring in conventional settings are neither scalable nor effective in virtual environments. This project envisages an AI-powered Proctoring System that utilizes computer vision and machine learning algorithms to automate and augment online examination supervision. The system makes use of live face detection, face recognition, and eye-gaze tracking to verify the candidate and observe behavior during the entire length of the exam. It also makes use of object detection and audio analysis for identifying unauthorized devices, multiple faces, or background voices, which can be used as indicators of cheating attempts. The system automatically marks and logs any suspicious activities for examination. Through the integration of deep learning-based models like Convolutional Neural Networks (CNNs) for video testing and Natural Language Processing (NLP) for voice anomaly detection, the system provides a secure, scalable, and economical online test environment for a cost-effective alternative to human invigilation. The system does not only reduce the reliance on human invigilators but also increases the fairness and integrity of remote tests.

Keywords: Artificial Intelligence (AI), Online proctoring, Eye gaze tracking, Facial recognition, Automated invigilation.

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## | 0156| Progressive Learning Strategies for Image Super-Resolution with Deep Neural Network

Prashant Kumar Tamrakar<sup>1, #</sup>, Soniya Sinha<sup>2</sup> Abhijeet Yadav<sup>3</sup>, Asha Verma<sup>4</sup>, Pooja Singh<sup>5</sup>, Mitali Singh<sup>6</sup>

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#### **ABSTRACT:**

Image super-resolution (SR) has gained significant attention in recent years due to its potential applications in medical imaging, satellite imagery, and video enhancement. This paper explores progressive learning strategies to enhance the performance of deep neural networks (DNNs) for image super-resolution. By incrementally increasing the complexity of training tasks, our approach allows networks to better generalize across varying image scales and noise levels. We propose a novel framework that integrates multi-stage training, dynamic loss functions, and attention mechanisms to progressively refine image details while preserving contextual integrity. Experimental results demonstrate that the proposed method outperforms state-of- the-art SR models on popular benchmarks, achieving supe- rior performance in terms of both PSNR and SSIM metrics. Furthermore, our approach shows robustness in handling real- world images with diverse degradations, establishing its utility in practical applications.

Keywords: Image Super-Resolution; Progressive Learning; Deep Neural Networks; Attention Mechanisms; PSNR; SSIM; Multi-Stage Training, Image Restoration.

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## | 0158 | A Literature Survey on Deepfake Detection

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#### **ABSTRACT:**

The quick development of deep learning-based synthetic media production has made deepfake detection an important research topic. False information by deepfakes causes serious threats to Security and privacy. It may alter audio, video, and images to produce incredibly lifelike fakes. There are many deepfake detection methods are examined in this literature review, which are divided into three categories" deep learning, watermarking, and blockchain". The difficulties with datasets, generalization, and the adversarial robustness of detection models are also covered. Many developments have been done such as multimodal detection frameworks, interpretable explainable AI, and the effect of generative adversarial networks (GANs) on detection effectiveness are highlighted in the study. Lastly, open challenges and future research areas are described to improve deepfake detection's scalability, performance, and practicality.

Keywords: Deepfake detection, systematic literature review, Deep learning, Watermarking, Blockchain, Dataset

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## | 0162 | Scalable Oversight: Techniques for Aligning Superhuman AI with Human Intent

Bhawana Meher<sup>1, #</sup>, Aditya Tiwari<sup>2</sup> Priyank Kumar Sahu<sup>3</sup>, Neha Kumari<sup>4</sup>, Ambika Singh Sengal<sup>4</sup>, Ashutosh Tandan<sup>5</sup>

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### **ABSTRACT:**

As artificial intelligence systems surpass human-level performance in increasingly complex domains, ensuring their alignment with human intent becomes a critical challenge. Scalable oversight refers to methods that enable humans to effectively supervise and guide AI systems, even when those systems operate beyond human comprehension. This paper explores emerging techniques for scalable oversight, including debate, recursive reward modelling, and human-AI collaboration frameworks. We analyze the strengths and limitations of these approaches in maintaining robust alignment while minimizing risks from mis generalization or deceptive behaviors. Additionally, we investigate the role of interpretability tools and automated alignment verification in enhancing oversight scalability. Through case studies in reinforcement learning and large language models, we demonstrate how these techniques can improve AI safety without imposing prohibitive human labour costs. Our findings highlight promising directions for future research, emphasizing the need for adaptive oversight mechanisms that evolve alongside AI capabilities. This work contributes to the broader discourse on AI alignment by providing a systematic evaluation of scalable oversight strategies, offering insights for researchers and practitioners aiming to develop safer, more reliable superhuman AI systems.

Keywords: AI alignment, scalable oversight, superhuman AI, human intent, reinforcement learning, interpretability, AI safety.

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## |0169| Real-time Twitter Sentiment Analysis on Political Events

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### **ABSTRACT:**

In the era of the digital age, social media sites have emerged as a potent tool for public discussion, particularly during political events like elections, debates, policy rollouts, and global summits. This project seeks to create a real-time sentiment analysis system to track and analyze public sentiment towards political events from Twitter data. The system suggested utilizes natural language processing (NLP) methods and machine learning algorithms to label tweets with sentiment categories like positive, negative, or neutral. With the Twitter API, the system retrieves tweets in real-time for trending political hashtags and keywords. The data is preprocessed by tokenizing, removing stop words, stemming, and vectorization. Then, a supervised machine learning classifier like Logistic Regression or a deep learning model like BERT (Bidirectional Encoder Representations from Transformers) is trained with labeled datasets to conduct sentiment classification with high accuracy. The predictions are represented visually using dynamic dashboards that show sentiment trends over time, geographical sentiment distribution, and keyword clouds. This gives useful insights into shifts in public opinion, political polarization, and the success of political campaigns. The system is extensible and can be made to track many languages and regions, providing a powerful instrument for political analysts, media agencies, and researchers.

Keywords: Sentiment analysis, Natural language processing(NLP), BERT, Machine learning

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## | 0171| Blockchain and Ai for Secure Data Sharing

Priyank Kumar Sahu<sup>1,#</sup>, Aditya Tiwari <sup>2</sup>, Ambika Singh Sengar<sup>3</sup>, Neha Kumari<sup>4</sup>, Ashutosh Tandan<sup>5</sup>, Bhawana Meher<sup>6</sup>

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### **ABSTRACT:**

In an era where data is the new oil, ensuring secure, transparent, and intelligent data sharing has become a crucial challenge. This research explores the synergistic integration of Blockchain technology and Artificial Intelligence (AI) to enable secure, decentralized, and intelligent data exchange across various domains such as healthcare, finance, and smart cities. The proposed model leverages blockchain's immutability and transparency to record data access and sharing logs securely, ensuring trust without relying on centralized authorities. Simultaneously, AI algorithms are deployed to automate access control decisions, detect anomalies in real time, and ensure only authorized entities interact with sensitive data. Smart contracts are used to define and enforce datasharing policies dynamically. A hybrid architecture is designed, where lightweight blockchain protocols handle integrity and traceability, while AI modules ensure contextual security and predictive threat detection. This model addresses common concerns like data tampering, privacy leaks, and unauthorized access. A prototype implementation demonstrates how the combination of these technologies can ensure secure, policy-driven, and intelligent data sharing in untrusted environments. The study concludes that the convergence of blockchain and AI not only strengthens data privacy and integrity but also enhances trust and automation in modern data-driven systems.

Keywords: Block-chain, Artificial Intelligent, Secure Data Sharing, Smart Contracts, **Privacy Preservation** 

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# | 0173| Pulse of the Public: Big Data-Driven Sentiment and Trend Mining on Twitter

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### **ABSTRACT:**

In today's digital era, social media platforms like Twitter generate massive volumes of real-time data that reflect public opinion, sentiment, and emerging trends. This research focuses on leveraging Big Data technologies to analyze Twitter data for sentiment analysis and trend prediction. By capturing and processing large-scale tweets using tools such as Apache Kafka, Spark, and Natural Language Processing (NLP) techniques, this study aims to understand the emotional tone behind posts and forecast trending topics based on user behavior. The system pipeline includes data collection via Twitter API, real-time processing using Spark Streaming, and sentiment classification using machine learning models. It also integrates trend analysis to identify popular hashtags, topics, and event-based public responses. A case study involving a recent sociopolitical event is presented to demonstrate the framework's effectiveness. This research highlights the potential of real-time analytics in extracting actionable insights from unstructured social media data, with applications in marketing, politics, disaster response, and public health monitoring. Challenges related to data noise, scalability, and privacy are also discussed, reinforcing the growing role of real-time analytics in capturing the "pulse of the public" for informed decision-making.

Keywords: Big data, Sentiment analysis, Trend Prediction, Machine learning, Real time analysis.

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## | 0201| Enhancing Transportation Efficiency: The Role of IoT AI and Autonomous Vehicles in Intelligent Transportation Systems

Shweta Singh<sup>1, #</sup>, Farhat Anjum,<sup>2</sup> Chetna Sahu<sup>3</sup>, Varsha Yadav<sup>4</sup>, Kavita Prasad<sup>5</sup>, Bindu Kashyap<sup>6</sup>

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### **ABSTRACT:**

Through intelligent transportation systems (ITS), this review examines the function of the Internet of Things (IoT), Artificial Intelligence (AI), and Autonomous Vehicles (AVs) in tackling these challenges. By offering real-time traffic data, reducing human mistake, optimizing routes, and increasing the reliability of public transportation, IoT-based ITS may improve transportation efficiency. Additionally, AI enhances ITS by facilitating autonomous driving, dynamic signal control, and predictive analytics, all of which contribute to safer roadways, lower emissions, and more sustainable urban growth. In spite of these benefits, there are still a number of issues that need to be resolved, including network restrictions, security risks, a lack of uniformity, and public acceptance. The review also emphasizes the possibility of combining IoT with blockchain technologies to improve system integrity and functionality. The convergence of IoT, AI, and AVs provides a transformative path toward more sustainable, safer, and intelligent urban transportation networks as cities develop.

Keywords: Transportation, IoT (internet of things), AI (artificial intelligence), Autonomous Vehicles, Intelligent Transportation Systems (ITS).

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## |0204|Real-Time Link Analysis and Phishing Threat Detection with a Novel Browser Extension

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### **ABSTRACT:**

This project explores the development and deployment of "Real-Time Link Analysis and Phishing Threat Detection with a Novel Browser Extension", a browser-based tool designed to evaluate the legitimacy and security of websites through real-time domain analysis and license-based access control. Built as a Chrome extension, the system integrates multiple backend technologies including WHOIS record retrieval, TLD (Top-Level Domain) verification, HTTPS enforcement, and monetization via Gumroad's secure license verification API. The underlying Flask backend is hosted on Render, ensuring availability, scalability, and independence from the user's local machine. Using a single-click interface, users can initiate a legitimacy check which analyzes the domain's registration history, connection security, and potential risk based on domain suffix reputation. A one-time free scan is offered per IP address, after which unlimited access is unlocked via a verified license key. The extension enforces IP-bound license validation to prevent key reuse across devices. Users receive instant feedback in the interface, and upon successful license validation, promotional and verification interface elements are automatically hidden for a cleaner experience. No personally identifiable information is stored or collected, preserving user privacy while enabling secure access control. The project leverages key web technologies and AI-adjacent principles of automation, scalability, and decision-making to create a user-friendly, privacyrespecting, and commercially viable browser security assistant. The tool demonstrates strong potential for reducing exposure to suspicious sites, offering educational utility and practical application for end users, especially those lacking technical expertise in cybersecurity.

Keywords: Website Legitimacy Detection; Chrome Extension; Gumroad License Verification; Cybersecurity Tool; WHOIS Domain Analysis

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## |0206|A Comprehensive Analysis of Data Science: **Associated Problems and Their Uses**

,Varsha Yadav<sup>1,#</sup>,Farhat Anjum<sup>1</sup>, Chetna Sahu<sup>1</sup>, Jaspreet Kaur<sup>1</sup>, Kavita<sup>1</sup>, Shweta Singh<sup>6</sup>

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### **ABSTRACT:**

The study of extracting, collecting, assembling, representing, and safeguarding data for use in technical or business contexts is known as data science. Although the term "data science" seems to imply databases and software engineering, several quantitative and qualitative skills, including nonmathematical skills, are also needed in this field. Information analysis is the primary function of data science. This essay provides an example of what data science is. The report ends with several recommendations for additional data science research. The writers of this paper will try to explore the various problems, implementations, and challenges in the field known as data science.

Keywords: data science, software engineering

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## | 0213 | AI-Based Air Defence System for Neutralizing Ballistic Missiles

Chandra Shekhar Nagendra<sup>1,#</sup>, Aradhna Sahu<sup>2</sup>, Bhavya Priyadarshni<sup>3</sup>, Khushi Mahato<sup>4</sup>, Shubham<sup>5</sup>

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### **ABSTRACT:**

Ballistic missiles pose one of the most formidable challenges to modern air defence due to their high speeds, steep trajectories, and potential use of decoys. Traditional missile defence systems rely on layered radar and interceptor networks, but they are increasingly strained by complex threat environments and massive data streams. This paper proposes a comprehensive AI-based air defence systems which are designed to detect and track, classify, and intercept incoming ballistic missile threats with improved efficiency. We first review the ballistic missile threat spectrum and existing defence architectures. Next, we go over how each step of the kill-chain (Figure, Fix, Track, Target, Get involved, Assess) can be improved by machine learning along with artificial intelligence techniques like neural networks with deep layers, learning by reinforcement, and sensor fusion. Key components of the proposed system include multi-sensor data fusion, real-time trajectory prediction, warhead-decoy discrimination, and autonomous command-and-control support. A conceptual system architecture is described, and example scenarios (e.g. saturation attacks or hypersonic threats) are analysed to illustrate potential gains. Hypothetical simulation results suggest that AI augmentation could improve detection accuracy by ~10-15% and engagement success rates by ~5–10% compared to baseline methods. The paper also addresses implementation challenges such as adversarial countermeasures, cyber-security, and human-machine teaming. We conclude that integrating AI into air defence systems can significantly boost performance against ballistic missile threats, provided careful validation and robust design are implemented.

Keywords: Ballistic Missiles, Air Defence, Artificial Intelligence, Sensor Fusion

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## | 0216 | Forecasting Futures: The Role of Machine Learning in Enhancing Educational Outcomes and Personalizing Student Interventions

Bindu Kashyap<sup>1, #</sup>, Jyoti Upadhyay<sup>2</sup>, Shweta Singh<sup>3</sup>

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### **ABSTRACT:**

This review paper examines the impact of various factors on students' academic performance, utilizing advanced data analysis and machine learning techniques. It highlights the significance of predictive analytics in education, focusing on how historical data can inform future outcomes. The study emphasizes the role of demographic variables such as gender, ethnicity, parental education level, and lunch status in influencing test scores. By employing classification methods, particularly decision trees and probabilistic classification, the study aims to extract valuable insights from educational datasets. These insights are crucial for identifying at-risk students, personalizing learning experiences, and enhancing teaching strategies. The findings underscore the importance of data-driven decision-making in higher education, facilitating targeted interventions and resource allocation to improve student success and retention.

Keywords: Academic Performance, Predictive Analytics, Demographic Variables, Classification Methods, Data-Driven Decision-Making.

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## | 0218 | Challenges and Opportunities for Cloud Kitchens in the Food Industry of India

K. J. Satao<sup>1,#</sup>, Ajay Kushwaha<sup>1</sup>, Bharat Pesswani<sup>1</sup>, Deepak Pandey<sup>1</sup>, Gaurav Sahu<sup>1</sup>, Kirti Kale<sup>1</sup>, Vikas Singh<sup>1</sup>

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### **ABSTRACT:**

Cloud Computing's origin lies in the 1960s with Time-Sharing and Remote Job Entry(RJE). It sprouted to virtualized services in the 1990s. The term "cloud" was used to describe a universe of virtualized services by General Magic in 1996, allowing multiple users to access computing resources remotely. The first cloud kitchen is believed to have been started in 2009 by a company called Just Eat, in London. The early 2010s saw the rise of food delivery platforms like Zomato and Swiggy. In India, the cloud kitchen concept started to take off in 2014 with the launch of Rebel Foods(initially Faasos, founded in 2011 by Jaydeep Barman and Kallol Banerjee, a physical QSR(Quick Service Restaurant)). Cloud kitchens arose as a answer to increasing costs of food items and growing customer favourites in the food industry. The traditional restaurant models(high rent, high establishment cost, high staffing costs, etc.) also led to the advent of cloud kitchens, focusing on delivery-only or takeout-only dealings. The orders are placed through the food delivery apps or directly on the cloud kitchen's website, and the food is then prepared and delivered to the customer's location. This reduces costs and increases efficiency. Cloud kitchens continue to grow, offering a cost-effective and scalable way for restaurants to expand their reach and offer new cookery concepts. Although Cloud Kitchens is a relatively new concept in India but it has already significantly impacted the food industry in India. It has made it easier for people to access various food options and created new job opportunities. While some challenges are associated with cloud kitchens, there are many opportunities for growth and innovation. This paper explores the challenges and opportunities for cloud kitchens in the food industry of India.

Keywords: Cloud, Cloud Computing, Cloud Kitchen, Food Delivery Apps.

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## | 0223 | Role of Artificial Intelligence in IoT for Enhancing User Experience in Smart Home

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### **ABSTRACT:**

This paper explores the integration of Artificial Intelligence (AI) with the Internet of Things (IoT) to enhance user experience in smart homes. Al-driven lol systems have revolutionized how smart homes interact with their users. improving automation, learning user preferences, and ensuring privacy. The paper delves into the technical aspects of Allot integration, focusing on personalized automation, intelligent decision-making, adaptive control systems, and data privacy concerns. The research aims to demonstrate how these systems create a seamless, intuitive, and responsive living environment that evolves to meet the unique needs of its occupants. The impact of Al on user convenience, energy efficiency, and security in smart homes is analysed, alongside potential challenges in maintaining privacy and user trust.

Keywords: Artificial Intelligence, Internet of Things, Smart Homes. User Experience, Automation, Data Privacy, Smart Home Systems.

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# | 0226 | Artificial Intelligence Transforming the Education System

Sushma Shrivastava<sup>1</sup>, Dr Neema Balan<sup>1</sup>, Yash Shrivastava<sup>2</sup>, Jyoti Tiwari<sup>1</sup>, Kiran Tiwari<sup>1</sup>

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### **ABSTRACT:**

This essay explores the transformative impact of Artificial Intelligence (AI) on the education systems. AI technologies are being increasingly integrated into classrooms and educational systems, influencing how students learn and how teachers instruct. The essay highlights key applications such as personalized learning, automation of administrative tasks, intelligent tutoring systems, and enhanced accessibility for diverse learners. It also discusses the benefits of data-driven insights and addresses critical challenges, including data privacy, equity, and the irreplaceable role of human educators. The aim is to provide a comprehensive understanding of how AI can be thoughtfully and effectively implemented to improve educational outcomes while maintaining ethical and inclusive practices.

Keywords: Artificial Intelligence, Education, Personalized Learning, Intelligent Tutoring Systems, Automation, Accessibility, Data Analytics, Educational Technology, AI in Schools, Inclusive Education.

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# |0244|Smart Farming: Using Machine Learning to Recycle Animal Waste into Organic Fertilizers and Soil Enhancers

Satyendra Prajapati<sup>1,#</sup>, Rubi Kambo<sup>1</sup>, Pulkit Dansena<sup>1</sup>, Sheikh Md Ayaz<sup>1</sup>

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### **ABSTRACT:**

As electric vehicles (EVs) gain popularity, the need for an efficient and user-friendly charging system becomes more urgent. This project presents a smart EV Charging Station App developed to make the charging experience smoother and more reliable. The app helps users find nearby charging stations, check their real-time availability, reserve slots, navigate easily, and pay securely—all in one place. Built with technologies like React Native, Node.js, Firebase, and integrated with map services, the app uses AI to reduce wait times and improve scheduling. It also includes features like user reviews and strong data protection. Real-world testing showed reduced waiting by 20% and high user satisfaction. Beyond convenience, the app contributes to better planning of EV infrastructure by collecting anonymous usage data for future insights.

Keywords: waste valorization, sustainable agriculture, ML

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## | 246 | Enhancing Agricultural Resilience in Chhattisgarh: A Multimodel Approach for Forecasting Prices of Top Vegetable Commodities

Rubi kambo<sup>1</sup>, Sneha. CA<sup>2</sup>, Neha kumari<sup>3</sup>, Bhawna Meher<sup>4</sup>

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### **ABSTRACT:**

This study presents a comparative analysis of traditional statistical models (ARIMA, SARIMA) and deep learning techniques (LSTM, CNN, MLP) for forecasting the prices of five key vegetables in Chhattisgarh—Tomato, Potato, Brinjal, Cauliflower, and Cabbage. Using historical price data from 2009 to 2023, along with climatic and policy variables, the models are evaluated based on predictive accuracy. The findings reveal that deep learning models, particularly LSTM, demonstrate superior performance by effectively capturing non-linear trends and seasonal fluctuations. The results offer valuable insights for stakeholders in agricultural planning and market decision-making.

Keywords: Agricultural resilience, Price forecasting, LSTM, CNN, SARIMA, Chhattisgarh, Vegetables.

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# |0258| Comparative Analysis of Reinforcement Learning Algorithms for Lane-Following in 2D Simulations: A Study on Generalization, Robustness, and Policy Interpretability

M Lucky<sup>1</sup>, Padmavati Shrivastava<sup>2</sup>, Rishita R Nair<sup>1</sup>, Tanishk Pandey<sup>1</sup>, Rani Namdev Sinha<sup>2</sup>

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### **ABSTRACT:**

Autonomous driving systems increasingly leverage reinforcement learning (RL) for lane-following tasks, yet significant challenges remain in developing policies that balance robustness, generalizability, and interpretability. While existing research has explored individual algorithms or specific robustness enhancement techniques, there remains a critical gap in comprehensive comparative studies evaluating modern RL approaches across these key dimensions in controlled environments.

This study presents a systematic comparison of five state-of-the-art RL algorithms - Double DQN, Dueling DQN, PPO, TD3, and QR DQN - for lane-following in 2D simulations. To evaluate and compare these popular RL algorithms we implement each algorithm within a 2D simulator and assess performance across three critical aspects: (1) generalization through varying lane curvatures and road configurations, (2) robustness against sensor noise and partial observability conditions, and (3) interpretability using saliency mapping and symbolic policy approximation techniques.

Our methodology enables direct comparison of both value-based (DQN variants, QR DQN) and actor-critic (PPO, TD3) approaches, revealing the distinct trade-offs in learning efficiency, control stability, and decision transparency.

Keywords: Reinforcement Learning, Lane-Following, Autonomous Driving, 2D Simulation, Double DQN, Dueling DQN,

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## |0261| Zero-Knowledge AI Inference on Blockchain

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## **ABSTRACT:**

As artificial intelligence (AI) becomes deeply integrated into blockchain-based systems, there is growing demand for secure, privacy-preserving AI services that can operate in decentralized environments. Ensuring user input and model confidentiality during AI inference is crucial, particularly in public blockchain infrastructures where all transactions are visible by default. Current privacy-enhancing techniques in machine learning, such as differential privacy or federated learning, fall short in blockchain contexts due to their dependence on centralized or semi-centralized computation. Moreover, while zero-knowledge proofs (ZKPs) offer promising privacy guarantees, their use in verifying AI inference remains largely unexplored in real-world, scalable systems.

This research aims to design a privacy-preserving framework for verifiable AI inference on blockchain using ZKPs. The goal is to protect both input data and model parameters while enabling trustless verification of AI outcomes with minimal on-chain computational cost. The proposed solution leverages zk-SNARKs and zkML principles to separate the computation (off-chain) and proof verification (on-chain). We plan to implement the proposed architecture using publicly available zero-knowledge proof frameworks, such as Zokrates and EZKL, to handle proof generation and verification tasks. A series of experiments will be conducted using small to medium-scale neural networks to evaluate system performance across metrics such as proof generation time, verification latency, and gas consumption.

Keywords: Zero-Knowledge Proofs, zkML, Blockchain, AI Inference, Privacy- Preserving Machine Learning, Zokrates, Decentralized AI, Smart Contracts, zk- SNARKs

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## |0263| AI-Driven Personalized Learning for Dyslexic Students

Manshi Verma<sup>1</sup>, Padmavati Shrivastava<sup>2</sup>, Aman Kumar Verma<sup>1</sup>, Vidhi Mehta<sup>1</sup>

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### **ABSTRACT:**

Dyslexic students face persistent challenges in traditional educational environments, often leading to reduced literacy development and academic disengagement. While adaptive learning platforms have improved general content delivery, few are tailored to the neurocognitive profiles of dyslexic learners—particularly within resource-constrained educational contexts. This study presents a software-defined, AI-based adaptive reading assistant that utilizes webcam-derived gaze data to personalize reading experiences in real time, without the need for specialized hardware.

The system architecture integrates a lightweight CNN for real-time pupil localization (via OpenCV 4.8) with a TorchScript-optimized temporal transformer model for decoding saccadic behavior and fixation clusters. A multi-objective optimization engine modulates typographic parameters—including font type (OpenDyslexic, ComicNeue), line height (1.2–2.0em), kerning (±15%), and word pacing (300–700ms)—based on gaze dynamics and inferred cognitive load. The model was trained on a composite dataset of 5,200 eyetracking sequences, including 2,400 real classroom samples and 2,800 synthetic samples generated using UnityEye and refined via CycleGAN-based realism transfer.

*Keywords:* AI in education, dyslexia, personalized learning, eye-tracking, gaze detection, low-resource schools,

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## |0265| Blockchain-Based Voter Identity and Voting System

Gourav Kumar Ojha<sup>1, #</sup>, Padmavati Shrivastava<sup>2</sup>, Salwi Kumari<sup>1</sup>, Ankit Kumar Singh<sup>1</sup>, Onika Parmar <sup>2</sup>

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### **ABSTRACT:**

Electoral systems worldwide face persistent challenges such as voter fraud, impersonation, and administrative inefficiencies, particularly in large democracies like India with over 800 million eligible voters. While traditional Electronic Voting Machines (EVMs) have improved efficiency, concerns remain regarding security vulnerabilities and auditability. This study proposes Blockchain-Based Voter Identity and Voting System, a secure and transparent framework that integrates distributed ledger technology with robust identity verification mechanisms.

The system employs a permissioned blockchain to record votes immutably, ensuring end-to-end verifiability through smart contracts. Voter authentication is strengthened using biometric face recognition and secure NFC tokens, preventing duplicate or fraudulent voting. A hybrid architecture combines a consortium blockchain for encrypted vote storage, decentralized IPFS for ballot and biometric data, and a mobile application for seamless voter registration and polling.

Large-scale democracies (e.g. India's) require robust identity management to prevent fraud and maintain confidence. We propose a permissioned blockchain framework to generate and register tamper-resistant voter IDs by combining biometric verification, decentralized identifiers (DIDs), and distributed storage. Each citizen's identity is first validated via biometrics (fingerprint or iris scan) against national ID databases. After registration, each voter receives a secure NFC-enabled token (smartcard or mobile credential) containing their cryptographic key pair and DIDNFC-based Voter Identification Near-Field Communication (NFC) technology offers a quick way to read identity data from smart cards or smartphones

Keywords: Blockchain, Distributed Ledger Technology (DLT), Electronic Voting, Digital Identity, Voter Registration, Biometric Authentication,

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## |0266| AI-Enabled Real-Time Traffic Control System for Reducing Congestion in Urban Environments

Authors: Rishu Ghosh<sup>1</sup>, Padmavati Shrivastava<sup>2</sup>, Sourav Kumar<sup>1</sup>, Sagen Murmu<sup>1</sup>,m Aparna Raha<sup>2</sup>

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### **ABSTRACT:**

Urban traffic congestion has become a growing concern in modern cities due to increasing vehicle density, limited road infrastructure, and inefficient traffic signal management. These issues lead to longer travel times, higher fuel consumption, increased air pollution, and commuter frustration. Traditional traffic control systems, which rely on fixed signal timings and pre-programmed responses, often fail to adapt to real-time fluctuations in traffic flow.

This study introduces a conceptual framework for an Artificial Intelligence-based Real-Time Traffic Management System designed to tackle urban congestion through intelligent decision-making and adaptive traffic control. The core idea is to create a responsive system that can continuously analyze traffic conditions and adjust signal timings to improve vehicle movement efficiency across intersections.

The proposed system utilizes data collected from IoT-based sensors, traffic surveillance cameras, and GPS-enabled vehicles. Convolutional Neural Networks (CNNs) are used to process visual input, enabling accurate detection of vehicles, lanes, and congestion levels. In parallel, Reinforcement Learning (RL) algorithms analyze traffic patterns and adjust signal timings dynamically based on real-time feedback, allowing for a self-learning, adaptive control mechanism.

Keywords: Artificial Intelligence, Real-Time Traffic Control, Urban Congestion, Reinforcement Learning, Convolutional Neural Networks, IoT, Smart Cities, Traffic Signal Optimization, SUMO Simulation, Intelligent Transportation Systems.

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## | 0277| Advancing Cyber security: A Comprehensive Review of AI-Driven Detection Techniques

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## **ABSTRACT:**

The growing culture of cyber-attacks demands higher intelligent and adjustable defence system. Conventional security system often struggling in detecting and reducing new, unknown strikes of real-time. For threat detection, response and prevention, Artificial Intelligence (AI) has emerged like a transformative force in cyber security, offering powerful tools. This review explores the current landscape of AI-driven detection techniques, focusing on machine learning (ML), deep learning (DL), natural language processing (NLP), and hybrid models. It evaluates their effectiveness, challenges, and future directions in enhancing cyber security resilience.

Keywords: Artificial Intelligence; cyber security; machine learning; deep learning; conventional security; natural language processing

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# | 0278| AI-Powered Noise Pollution Monitoring & Source Identification System

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### **ABSTRACT:**

Urban noise pollution is a serious but oftentimes underestimated threat to environmental and public health, particularly in rapidly expanding smart cities. Existing methods rely on stationary, high-cost sensors that lack smart classification capabilities. This project introduces an AI-enabled real-time noise pollution monitoring system with source detection using low-cost hardware and machine learning, generating scalable, actionable insights.

The algorithm utilises MFCC extraction through Librosa to analyse ambient city sounds using smartphones or USB microphones. A light Convolutional Neural Network (CNN) or ensemble model (i.e., Random Forest) is trained on the UrbanSound8K dataset to accurately label common sources of noise like traffic, building construction, machinery, and speech.

Noise levels are geospatially visualized as interactive heatmaps for identifying hotspots of pollution with OpenCV and Folium. Audio data is geospatially linked with GPS metadata (simulated or actual) for offering localized and intuitive noise analysis to policymakers and urban planners.

This research is distinguished by its synthesis of audio classification, environmental sensing, and geospatial visualisation, and is an interdisciplinary contribution to AI for environmental engineering.

Keywords: Noise pollution monitoring, urban sound classification, edge AI, geospatial visualization, smart cities, CNN, Librosa

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## | 0281| AI-Powered Fake News and Deepfake Detection

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## **ABSTRACT:**

The rise of AI-created deepfakes and fake news has become a serious threat to information veracity, undermining public trust in online media platforms. Increasing research highlights the problem, with over 60% of internet users reporting confusion in distinguishing real content from AI-constructed misinformation (Pew Research Center, 2023).

To counter such threats, sophisticated detection tools have emerged that leverage the power of machine learning (ML), natural language processing (NLP), and biometric detection. These detection tools detect indicators of manipulation—such as face micro-movements, inconsistencies in voice tone, and suspicious metadata patterns—detecting with up to 90% accuracy in a laboratory setup (MIT Technology Review, 2024).

This study embraces a robust mixed-methods approach to measure both the technological effectiveness of detection devices and the changing shape of public trust. The quantitative portion entails a meta-analysis of detection precision measures drawn from peer-reviewed journals (2020–2024), supplemented with survey information from reputable institutions like Pew Research and Eurobarometer. These datasets provide for an analysis of detection effectiveness in addition to user knowledge and Skepticism patterns.

The qualitative aspect provides richness via case studies, such as the very prominent 2023 Indian election deepfake case, and analytical discussion of global policy actions, specifically the EU AI Act. In addition, this research testing assesses top open-source detection tools, including

Microsoft Video Authenticator and Deepfake Scanner, comparing them to cutting-edge generative AI models such as GPT-4 and DALL·E 3.

Keywords: Fake news, AI detection, deepfake technology, misinformation, digital media trust, machine learning, regulatory frameworks

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## | 0292 | AI-Driven Strategic Insights: Predicting Competitive RTS Game Outcomes

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### **ABSTRACT:**

This study explores the use of machine learning techniques to analyse and predict match outcomes in real-time strategy (RTS) games. By leveraging historical gameplay data, we employ supervised and unsupervised learning methods to identify key player behaviours, map dynamics, and strategic decision-making patterns. The research integrates predictive modelling with feature engineering to uncover critical factors influencing win probabilities. Our findings highlight the impact of macro and micro-level strategies on competitive performance, paving the way for real-time analytics applications in AI-driven game intelligence.

Keywords: Supervised learning, Exploratory data analysis, Feature Vector Constructor, Machine learning classifiers

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## | 0304 | Attention Monitoring Systems in Book Reading: A Comprehensive Review

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### **ABSTRACT:**

Reader distraction is a major barrier to effective learning, especially in environments where students study independently or without constant supervision. This paper explores a practical solution to this problem by focusing on real-time monitoring of reader attention. We present a smart system that combines object detection and gaze estimation to check whether a person is actually looking at a book while reading. The system uses YOLO to detect the presence of a book and L2CS Net to analyze the reader's gaze direction. Together, they help determine if the reader is paying attention or getting distracted. This approach can support students by encouraging better focus, and it gives teachers and librarians helpful insights into reading habits and engagement levels. In the future, this system could track attention throughout entire reading sessions, offer personalized feedback, and make learning more interactive and tailored to individual needs.

Keywords: Attention monitoring, book reading, educational technology, cognitive science, engagement, comprehension.

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## | 0319| Smart Vision: A Review on Unified Deep Learning Framework for Real-Time Vehicle Detection and Annotation in Smart Surveillance Systems

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### **ABSTRACT:**

The need for sophisticated, scalable, and intelligent monitoring systems keeps rising as urban traffic gets more complicated. In this study, Smart Vision. A unified deep learningbased platform for automatic annotation and real-time vehicle detection in traffic surveillance video streams is presented. Unlike traditional multi-stage systems, Smart Vision integrates vehicle classification and bounding box generation into a single end-toend architecture powered by YOLOv5.Real-world security footage and publicly accessible datasets are used to train and validate the system, which performs well in difficult scenarios, including high traffic, occlusions, and dim lighting. Smart Vision's design ensures high scalability, low latency, and efficient use of resources for deployment on edge and cloud platforms. Object tracking, traffic flow analysis, and anomaly identification in dynamic urban contexts are among the important applications it enables. The system's excellent detection accuracy and real-time inference speeds are demonstrated via evaluations using common metrics like precision, recall, and mean Average Precision (mAP). Smart vision aids in the creation of intelligent transportation systems and more extensive smart city initiatives by removing the need for human annotation, improving situational awareness, and enabling energy-efficient surveillance.

Keywords: smart Vision, YOLOv5, vehicle detection, automated annotation, traffic surveillance, deep learning, real-time object detection, edge computing, smart cities, intelligent transportation systems (ITS)

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# | 0355| Intelligent Diagnosis of Foliar Diseases Using Advanced Machine Learning Techniques

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## **ABSTRACT:**

Agriculture is a critical sector for global food security, yet it is increasingly threatened by various plant diseases, particularly foliar diseases that affect crop leaves and reduce yield significantly. Early and accurate detection of these diseases is essential for effective treatment and sustainable farming. This study presents an intelligent system for the diagnosis of foliar diseases using advanced machine learning (ML) techniques. High-resolution leaf images are collected and preprocessed using noise reduction and segmentation methods. Feature extraction techniques such as texture, color, and shape descriptors are employed to capture key disease characteristics. These features are then used to train and evaluate multiple ML models including Convolutional Neural Networks (CNNs), Support Vector Machines (SVM), and Random Forest classifiers. Among them, CNN demonstrates superior performance in disease classification due to its deep learning capabilities. The proposed system achieves high accuracy, precision, and recall rates, validating its potential for real-time implementation in precision agriculture. This intelligent approach reduces reliance on manual inspection, minimizes crop losses, and supports timely decision-making for farmers.

Keywords: Foliar disease, Machine learning, Plant pathology, Leaf image analysis, Convolutional Neural Network (CNN), Precision agriculture, Image classification, Disease detection, Intelligent farming, Deep learning.

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## | 0356| A Comparative Study of Social Skills Among Teachers in Government and Non-Government Higher Secondary Schools

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### **ABSTRACT:**

Social skills are essential for effective teaching and fostering positive teacher-student relationships. This study aims to compare the social skills of teachers in government and non-government higher secondary schools. Employing a descriptive survey design, the research involved a stratified random sample of teachers from both types of institutions. Data were gathered using a standardized social skills inventory, and statistical tools such as mean, standard deviation, and t-tests were used for analysis. The results indicated notable differences in specific aspects of social skills. Teachers in non-government schools exhibited stronger interpersonal communication and adaptability, whereas teachers in government schools demonstrated higher levels of empathy and conflict resolution abilities. The study underscores the importance of institutional context in shaping teachers' social competencies and suggests the need for tailored professional development programs. Enhancing these skills can contribute to more effective teaching and improved educational outcomes.

Keywords: Teacher-Student Relationships, Standardized Social Skills Inventory

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## | 0381| Role of Cloud Computing in Post-COVID Healthcare Infrastructure

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## **ABSTRACT:**

The COVID-19 pandemic has transformed global healthcare systems, emphasizing the urgent need for scalable, flexible, and resilient digital infrastructure. Cloud computing has emerged as a crucial enabler in this transformation, offering dynamic resource provisioning, real-time data analytics, remote patient monitoring, and secure data sharing. This research paper explores the role of cloud computing in strengthening post-COVID healthcare infrastructure. It examines its applications, benefits, challenges, and future directions to enhance preparedness for future pandemics and enable value-based healthcare.

Keywords: Cloud Computing, Post-COVID Healthcare, Telemedicine, Electronic Health Records (EHR), Remote Patient Monitoring, Health Informatics, Healthcare Infrastructure

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## | 0395 | Cloud Computing in Education: Transforming Classrooms into Digital Ecosystems

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### **ABSTRACT:**

Cloud computing is changing the way we learn and teach by making education more flexible, scalable, and accessible to everyone. This paper looks at how cloud technology is turning traditional classrooms into connected digital spaces where students and teachers can easily collaborate, share resources, and enjoy personalized learning experiences. It covers important tools like online learning platforms, virtual classrooms, cloud storage, and data analytics. The paper also talks about some of the challenges schools face when adopting cloud services, such as concerns about data security, unequal access to technology, and infrastructure limitations. Finally, it explores future possibilities and offers suggestions on how to successfully use cloud computing to improve education around the world.

Keywords: Cloud computing, Digital learning, Online education, Learning management systems (LMS), Virtual classrooms, Educational technology, E-learning platforms

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# | 0396 | Tensor-based Machine Learning for Early Detection of Keratoconus Eye Condition.

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### **ABSTRACT:**

This project presents a deep learning-based approach for the classification and prediction of ocular diseases using structured clinical data. The dataset comprises 448 distinct features extracted from eye-related medical records, alongside categorical labels indicating disease classifications. The preprocessing phase involved data cleaning, removal of noninformative identifiers, and encoding of categorical labels to a suitable format for model training. A neural network model was developed using TensorFlow and Keras, structured with an input layer of 448 neurons, a hidden layer of 896 neurons with ReLU activation, and an output layer for classification across four categories. To enhance generalization and assess model robustness, a 10-fold stratified cross-validation was implemented. The model was compiled using the categorical cross-entropy loss function and optimized with the Adam optimizer. Accuracy was selected as the evaluation metric. The pipeline also utilized Scikeras to wrap the Keras model, making it compatible with Scikit-learn workflows and enabling integration with other preprocessing or evaluation tools. Preliminary results suggest that the proposed model effectively distinguishes between multiple ocular disease types, demonstrating the potential of deep learning in supporting clinical diagnosis and decision-making in ophthalmology. Future enhancements may include hyperparameter tuning, feature selection techniques, and incorporation of image data to further improve model performance and applicability in real-world settings.

Keywords: Deep learning, Neural Networks, Keras, Scikeras, Ocular Disease Classification, Tensorflow, Multiclass Classification, Data preprocessing

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## | 0400 | AI APPLICATION IN MINING INDUSTRY-A SUSTAINABLE WAY

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## **ABSTRACT:**

As a matter of relevance, it is significant to note that the mining industry contributes between 2.2% and 2.9% of India's total GDP, while its contribution to the industrial sector is around 10% to 11%. The future of valuable mineral mining, particularly e.g. lithium and other rare earth elements, is expected to significantly boost GDP contributions worldwide. This upsurge is driven by the growing demand for advanced materials used in space science, automobile industry, robotics, and modern defence systems. Therefore, the basic industry, like mining, cannot remain isolated from the growing use of Artificial Intelligence commonly known as AI.

About ten years ago, the deployment of autonomous trucks marked the beginning of the mining industry's adoption of AI, Machine Learning, and Autonomous technologies. Further efforts are underway to reduce costs, enhance efficiency and productivity through continuous operations, and improve worker safety by minimizing exposure to hazardous environments with the help of integrated AI, Machine Learning, and Autonomous machines, called robots. Obviously the aim is higher profit margins in today's competitive environment which is challenged by financial limitations, legal constraints and workforce resistance faced by the mining industry.

This article explores potential future areas of growth by examining the current state of AI technology adoption in the mining sector by addressing the concerns of all key **stakeholders** and paving the way for broader acceptance.

Keywords: Artificial Intelligence, Machine Learning, Autonomous Machine or ROBOTS, Constraints, Mining Industry, Production & Safety in Mines, Increased Efficiency, Profit Margin, Stake Holders.

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# | 0409 | Load Demand Forecasting with Neural ODEs and Temporal Fusion Transformers

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### **ABSTRACT:**

With the backdrop of energy transition globally, climate uncertainty, and economic uncertainty, load forecasting has become very crucial. The issues related to capturing the dynamic nature of power systems over considerably longer horizons of timestamps stiffen the traditional models used for load forecasting. Most of the previous methods probably account for discrete time-series models that tend to ignore the physical laws governing load consumption simply fail to consider non-linear relationships between economic, climatic, and technological factors. Here, we propose a new multi-model technique of Neural Ordinary Differential Equations, Temporal Fusion Transformers, and Hierarchical Variational Autoencoders for noise- and outlier-robust long-term load forecasting. Neural ODEs provide a mathematically based framework that models load demand as a continuous dynamic system, thereby ensuring the incorporation of physical laws for improved forecasting. The TFT uses attention mechanisms and recurrent neural networks to capture both short-term and long-term dependencies. Again, static and dynamic exogenous features such as changes in government policy and the economy are included for better interpretability of results. The hybrid model offers probabilistic scenarios of events, covering complex nonlinear dependencies and various scenarios of the future under changing conditions. HVAEs can overcome major shortcomings of traditional approaches when accuracy as well as reliability are improved. Neural ODEs will reduce MAPE by 10-15%, TFTs by 10-20%, and HVAEs by 8-12%. Also, the proposed framework will clearly provide well-defined uncertainty bounds as well as probabilistic forecasts, bringing out necessary insights for decision-makers in planning energy policy.

Keywords: Load Forecasting, Neural ODEs, Temporal Fusion Transformers

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# | 0413 | SentinelX - A Crime Detection System Using YOLO v11

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### **ABSTRACT:**

SentinelX is a real-time, AI-powered crime detection and alert system that revolutionizes traditional CCTV surveillance. The system harnesses a YOLO-based object detection model integrated with OpenCV to analyse live video feeds to identify critical incidents such as weapon detection (knives, guns), violence, and other suspicious behaviours. Once detected, the system highlights threats using bounding boxes, captures evidence via snapshots, and sends instant notifications including images and text through Telegram. A Flask backend supports this architecture, and a responsive web dashboard built with Bootstrap and JavaScript displays live streams, alerts, and analytics. This research paper demonstrates the seamless integration of computer vision, real-time processing, and mobile communication, offering a proactive surveillance mechanism for enhanced public safety.

Keywords: SentinelX; Real-Time Surveillance; YOLO-based Object Detection; OpenCV; Telegram Alerts; Weapon Detection; Proactive Surveillance; Public Safety

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## | 0415 | Mechanical Properties of Titanium Composite Foam

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### **ABSTRACT:**

Titanium composite foams are advanced lightweight materials known for their excellent mechanical properties, including high strength, low density, and good energy absorption. These foams are widely used in the aerospace, biomedical, and automotive industries due to their high strength-to-weight ratio, corrosion resistance, and biocompatibility. This review paper examines the mechanical properties of titanium composite foams, focusing on factors like porosity, reinforcement materials, and manufacturing techniques that influence their performance. Higher porosity reduces weight but may decrease strength, while adding ceramic or polymer reinforcements can enhance stiffness and energy absorption. Powder metallurgy and additive manufacturing are common methods to produce these foams with controlled structures. The study highlights key findings from recent research, comparing different compositions and processing methods. Understanding these properties helps optimize titanium foam designs for specific applications, such as aircraft components (where weight savings are critical) or bone implants (where biocompatibility and strength are essential). This review provides valuable insights for researchers and engineers working with titanium composite foams.

**Keywords:** Titanium composite foams, mechanical properties, aerospace, biomedical, and automotive industries

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# | 0419| Deep Learning for Dermatological Diagnosis: An AI-Based Approach to Skin Disease Detection

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### **ABSTRACT:**

Skin diseases represent significant global health concerns, often requiring timely and accurate diagnosis to prevent serious complications. Traditional diagnostic methods rely heavily on clinical expertise and can be subjective and resource-intensive. With advancements in artificial intelligence (AI), particularly deep learning, there is a growing opportunity to support dermatological diagnostics through automated image analysis. This paper presents a deep learning-based approach for detecting and classifying various skin conditions using dermoscopic images. A convolutional neural network (CNN) architecture, fine-tuned on a publicly available dataset, is employed to learn discriminative features directly from raw images. The proposed method demonstrates strong potential for augmenting clinical workflows, improving diagnostic consistency, and expanding access to dermatological care, especially in under-resourced regions. This research underscores the transformative role of AI in medical imaging and its capacity to enhance the accuracy and efficiency of skin disease detection.

Keywords: Skin disease, Deep learning, Convolutional neural network, Diagnosis

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## |0420| Kisan Sahayak: Edge-Deployable XAI System for Crop Disease Diagnosis with Multilingual Voice Explanations

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## **ABSTRACT:**

Farmers often struggle to quickly identify plant diseases, leading to significant crop losses. KisanSahayak is a smartphone app that addresses this by diagnosing leaf diseases in under 300 milliseconds using a lightweight MobileNetV3 model that works offline, making it accessible even in low-connectivity areas. A standout feature is its use of Grad-CAM heatmaps, which highlight affected areas on leaves, enhancing users' understanding of the diagnosis. The app also provides audio feedback in local languages like Hindi and English to assist users with varying literacy levels. Thorough testing, including data from the PlantVillage dataset and regional samples, shows KisanSahayak has over 98% accuracy. By combining rapid AI diagnosis with visual cues and voice assistance, KisanSahayak helps smallholder farmers make timely decisions about their crops.

Keywords: Explainable AI; Crop Disease Diagnosis; MobileNetV3; Grad-CAM; TensorFlow Lite; On-Device Inference; Multilingual Voice Feedback; Smallholder Farmers

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## |0434| AI-Driven Rice Disease Detection and Precision **Pesticide Recommendation System**

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#### **ABSTRACT:**

Rice cultivation is pivotal for global food security, yet it faces significant challenges from various diseases and pests that can substantially reduce yield and quality. Traditional methods of disease detection and pesticide application are often labor-intensive and prone to inaccuracies. This research proposes an advanced system that integrates deep learning techniques with precision agriculture to enhance rice disease management. Utilizing Convolutional Neural Networks (CNNs), the system accurately identifies multiple rice diseases from leaf images, achieving high classification accuracy. Post-detection, the system provides tailored pesticide recommendations, considering factors such as disease type, severity, and environmental conditions. This approach not only ensures effective disease control but also minimizes the overuse of chemicals, promoting sustainable agricultural practices. The proposed system is designed for real-time application, with a user-friendly interface accessible via mobile devices. This accessibility empowers farmers, especially in remote areas, to make informed decisions promptly. By bridging the gap between advanced AI technologies and practical agricultural needs, this research contributes to the advancement of smart farming techniques, aiming to increase rice productivity while safeguarding environmental health.

Keywords: Rice Disease Detection, Convolutional Neural Networks, Precision Agriculture, Pesticide Recommendation, Sustainable Farming, Deep Learning, Smart Agriculture

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## **|0437| Fake News Detection**

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#### **ABSTRACT:**

In the digital age, the rapid dissemination of fake news across platforms like social media poses a serious threat to public trust, decision-making, and social harmony. This paper presents a system designed to detect fake news using a combination of machine learning (ML), natural language processing (NLP), and image forensics. By analyzing text content and cross-verifying sources using Google's API, and integrating image morphing detection capabilities, the system provides a comprehensive solution to combat misinformation.

Keywords: Fake News Detection, Machine Learning, Natural Language Processing, Google Custom Search API, Image Morphing Detection, Flask.

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## | 0447| Hybrid Models using Deep Learning for **Enhanced Emotion Detection in Multilingual Texts**

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#### **ABSTRACT:**

In Natural Language Processing (NLP), emotion analysis from text is becoming more and more significant because of its potential to improve applications including humancomputer communication, mental health detection, and user experience design. With an emphasis on hybrid approaches that combine transformer-based designs (such as BERT and RoBERTa) with convolutional neural networks (CNNs), this paper examines current developments in deep learning models. The article examines how contextual and localized factors enhance model accuracy while examining multilingual datasets and fusion approaches used for emotion categorization. The focus is on the interpretability of model outputs and generalization across linguistic settings. Future directions and challenges in multilingual emotion recognition are discussed in the paper's conclusion.

Keywords: Multilingual NLP, Emotion Classification, Hybrid Deep Learning, CNN, BERT, RoBERTa, Transformer Models, Fusion Techniques

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## | 0463| The Burden of Cervical Cancer in Asian Countries: Analytical Report

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#### **ABSTRACT:**

Cervical cancer remains a critical public health issue across Asia, accounting for 58% of global cases, with India alone representing 23% of deaths. The disease, primarily caused by HPV (types 16/18), is largely preventable—yet vaccination rates remain low due to cost, cultural stigma, and weak health systems. Many nations struggle with limited screening access, particularly in rural areas where Pap smears and HPV testing are scarce. Late-stage diagnoses are common, worsened by poverty and low health literacy. However, progress is emerging: Japan, South Korea, and Malaysia have rolled out national HPV vaccines, while Thailand and India are scaling up low-cost screening like VIA. The WHO's 90-70-90 elimination strategy (90% vaccination, 70% screening, 90% treatment by 2030) offers a roadmap, but success hinges on infrastructure investment and stigma reduction. Pioneering efforts in Bhutan and Malaysia show free vaccination programs can boost coverage. To reduce disparities, Asia must prioritize equitable healthcare access, public education, and policy reforms. With coordinated action, the region can turn the tide against this preventable disease and meet global elimination goals.

This overview underscores the urgent need for strengthened HPV immunization programs, affordable screening, and public awareness to curb cervical cancer's burden in Asia and align with the WHO's global strategy for cervical cancer elimination by 2030.

Keywords: Cervical Cancer, Pap smears ,HPV, VIA, and WHO

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## | 0486 | Brain -Computer Interface (BCI) for Paralyzed Patients

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#### **ABSTRACT:**

An advanced communication system called a Brain-Computer Interface (BCI) eliminates the need for muscular movement by allowing direct communication between the human brain and external devices. Patients who are paralyzed and have lost voluntary motor control as a result of spinal cord injuries, strokes, or neurodegenerative diseases like ALS may benefit greatly from this technology. The fundamental idea behind a brain-computer interface (BCI) is to record brain signals, usually using non-invasive techniques like electroencephalography (EEG), process them in real time, and then translate them into commands that can be used to control assistive technologies like communication systems, robotic arms, and wheelchairs. The goal of this research is to create a BCI system that improves people's independence and standard of living. Challenges addressed include improving signal accuracy, reducing latency, ensuring system adaptability, and creating user-friendly interfaces. The study also explores the psychological and ethical considerations of integrating such systems into daily life. With advancements in machine learning, signal processing, and neurotechnology, BCIs represent a transformative solution for motor-impaired patients, enabling restored interaction with their surroundings and offering new hope for personal autonomy and social inclusion.

Keywords: Brain-Computer Interface, neurodegenerative diseases, electroencephalography

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### | 0487| Ai Based Multi-Detector Camera System

Jayanshi Ratan Sinha<sup>1</sup>, Saradhi Molika<sup>1</sup>, Aditi Verma<sup>1</sup>, Shubham Kumar<sup>1</sup>, Khushboo Mahato<sup>1</sup>, Aradhana Sahu<sup>1</sup>

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#### **ABSTRACT:**

This paper presents an AI based multi detector camera system design to make road safer and reduce the number of traffic related deaths and injuries. The system can automatically detect road accidents in real time and instantly send alerts to nearby hospitals, police stations and emergency services, which helps provide faster assistance to those involved. It also monitors traffic violations such as speeding, running red light, driving without helmets or seat belts, and shows signs of drunk driving by analysing driver behaviour through facial tracking. The camera system can also measure how crowded an area is, which is useful for managing traffic flow during busy hours or public events. The entire system is powered by deep learning models like YOLOv8 for object detection and MediaPipe for facial landmark tracking. These models help the system identify vehicles, people and risky situations with high accuracy. The setup can be deployed either or edge devices like Raspberry Pi or NVIDIA Jetson for local processing, or connected to the cloud for broader city-wide integration. Overall, this system offers a smart, automated and efficient solution for improving road safety, enforcing traffic rule, and responding quickly to emergencies, especially in smart city environments.

Keywords: AI Real time accident detector, Deep learning, Smart city, Emergency Alert System, Smart Surveillance

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## | 0489| Making Our Country's Security Stronger Aand Powerful Using Ai And Iot

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#### **ABSTRACT:**

In today's fast-changing world, countries face complex threats like terrorism, cyberattacks, natural disasters, and misinformation. Old security methods—based mostly on manual work and slow responses—are no longer enough. To build a safer and smarter nation, we must shift from reacting to problems to predicting and preventing them. This paper explores how Artificial Intelligence (AI) and the Internet of Things (IoT) can work together to improve national security. AI is very good at analysing large amounts of data, spotting patterns, and making quick decisions. When combined with IoT devices like cameras, drones, and sensors, these technologies can give security teams real-time information, help detect threats automatically, and take quick action in critical situations. We explain how this system can be used in areas such as smart surveillance, border control, cyber protection, disaster response, and even in predicting crime before it happens. The paper also discusses the structure of AI-IoT systems, real-life examples, the benefits they offer, the challenges they face, and the need to use them ethically and responsibly.

This research discusses the architecture of AI-IoT systems, use-case implementations, benefits, challenges, and ethical considerations. By harnessing these technologies, countries can shift from reactive to proactive security models, enabling faster decision-making and reducing human error. The paper concludes with policy recommendations and future directions for creating a safer and smarter nation using AI and IoT.

Keywords: Artificial Intelligence (AI), Internet of Things (IoT), National Security, Smart Surveillance, Predictive Policing,

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# | 0490| Ai – Skill Income Pathway Navigator For Youth

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#### **ABSTRACT:**

In today's rapidly evolving job market, many individuals—especially youth—struggle to secure the opportunities they deserve, not due to a lack of talent, but because their skills do not match current industry needs. The core purpose of this project is to guide and empower young people who are often affected by financial challenges and lack proper career direction. We propose an AI-based system that analyses a person's resume and compares it with real-time job market trends to identify skill gaps. Based on these insights, it recommends a personalized learning path that includes short courses, tutorials, and certifications. Integrated with platforms like Coursera and LinkedIn Learning, the system provides direct access to the most relevant and affordable learning resources. Beyond just job matching, our AI offers tailored career suggestions and practical ways for youth to begin earning early, even while they are still studying. This initiative not only boosts individual employability but also supports companies in finding skilled talent. By focusing on the growth and empowerment of youth, our goal is to reduce unemployment and build a generation that is financially independent, future-ready, and confidently guided by AI-powered support.

Keywords: Real Time Job Market; Employability; Empowerment of Youth; Financial Independent; AI-Powered Support

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# | **0491**| AI-Driven Predictive Maintenance for Smart Infrastructure: Enhancing Sustainability and Longevity.

Sejal Rawandhe<sup>1, #</sup>, Satish Kumar<sup>1</sup>, Utsav Raj<sup>1</sup>, Tasu Kumari<sup>1</sup>, Anand Mehta<sup>1</sup>, Aradhana Sahu<sup>1</sup>

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#### **ABSTRACT:**

With the growth of smart cities and modern infrastructure, maintaining these systems efficiently has become very important. Traditional maintenance methods often lead to unexpected breakdowns, higher repair costs, and reduced lifespan of infrastructure. This paper presents an AIbased approach for predictive maintenance that helps in identifying early signs of failure in infrastructure systems The proposed method uses data from sensors installed in infrastructure components such as bridges, roads, or machines. This data is analyzed using machine learning algorithms to detect patterns and predict possible faults before they happen. By doing this, maintenance work can be done at the right time, reducing the chances of sudden failures and saving resources. We also include explainable artificial intelligence (XAI) techniques in our system. This helps in making the predictions more understandable for engineers and decision-makers, increasing trust in the system. Different evaluation metrics like accuracy and reliability were used to test the performance of the model. The results show that our approach improves early detection and supports better planning of maintenance activities. This paper highlights how AI can be a useful tool in improving the performance, safety, and sustainability of smart infrastructure. It can help city planners and engineers manage infrastructure more effectively and contribute to the development of smarter and more sustainable cities.

Keywords: Predictive maintenance; smart infrastructure; machine learning; sensor data; explainable AI; sustainability.

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# | 0494| JUSTEASE – "The People's Law Assistant: Using AI to Bridge the Gap Between Citizens and the Constitution"

Vineet Dubey<sup>1</sup>, Ansh Raj<sup>1</sup>, Aditya Kumar shrivastava<sup>1</sup>, Susmita Mahato<sup>1</sup>, Riya Ghosh<sup>1</sup>, Aradhana Sahu<sup>1</sup>

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#### **ABSTRACT:**

JustEase is a multilingual, user-friendly legal awareness and assistance platform designed to simplify access to laws and rights for every citizen of India. The project aims to break down complex legal language and make the Constitution and important legal acts easily understandable through simplified content, categorized sections, and voice-based inputs.

Users can explore laws relevant to their situation such as Motor Vehicle Acts, education rights, or workplace harassment, with sections dedicated to different groups like college students, school children, or employees. The platform allows users to view case studies, refer to past verdicts, and understand how similar legal situations were handled. Additionally, users can file complaints directly through the site and track their progress, promoting easy and accessible legal action.

A unique feature includes the "Blind Case" option, enabling users to report unethical or suspicious activities anonymously. The website also facilitates connections to certified advocates based on user preferences, making legal help more approachable and efficient.

JustEase aims to empower citizens with legal knowledge, encourage lawful actions, and support students and individuals in learning and applying their rights with confidence.

Keywords: Anonymous Reporting & Tracking; Connect with Advocates; Role-Based Sections; Simplified Legal Access; Multilingual Legal Platform.

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## | 0054 | Driving the Future: A Comprehensive Analysis of the Transition to Electric Vehicles for Sustainable **Mobility**

Pradeep kumar<sup>1, #</sup>, Shaziya Islam<sup>1</sup>, Neelabh Sao<sup>2</sup>, Irshad Alam<sup>3</sup>, Mandeep Kumar<sup>4</sup>, Mimshad Alam<sup>5</sup>

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#### **ABSTRACT:**

The escalating environmental impact of conventional internal combustion engine (ICE) vehicles has intensified the global call for cleaner, more sustainable transportation solutions. Electric vehicles (EVs) have emerged as a promising alternative, offering reduced emissions, lower operating costs, and enhanced energy efficiency. This research paper investigates the transition toward electric mobility by analysing technological advancements, policy support, market trends, and socio-economic challenges associated with EV adoption. The primary objective is to evaluate the effectiveness and scalability of EVs in contributing to global sustainability goals. A mixedmethods approach was employed, including an extensive review of academic literature, analysis of global EV adoption statistics, and case studies from EV-leading nations such as Norway, China, and the United States.

The findings reveal that while EVs offer substantial environmental benefits and long-term economic advantages, their widespread adoption is constrained by factors such as high initial costs, limited charging infrastructure, and concerns over battery production and disposal.

Keywords: Electric Vehicles (EVs) Sustainable Transportation Environmental Impact Internal Combustion Engine (ICE) Vehicles EV Adoption Technological Advancements

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## | 0066 | Evaluating COP in Marine Applications with Contemporary Refrigerants

Suraj Kumar Bandhekar<sup>1, #</sup>, Rahul Mishra <sup>1</sup>, Sanjay G. Sakharwade<sup>2</sup>, Sameer Singh<sup>3</sup>, Kush Kumar Dewangan<sup>4</sup>, Anant Kumar<sup>5</sup>

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#### **ABSTRACT:**

Marine refrigeration systems aboard seagoing vessels and offshore facilities are crucial for maintaining refrigerated containers, cargo hold refrigeration, and domestic refrigeration on cruise ships. The International Maritime Organization's MARPOL Annex VI restricts the use of refrigerants that deplete the ozone layer in maritime applications. New regulations from the organization mandate that all stakeholders, including crew members and shipowners, transition to using modern refrigerants. Refrigerants such as R1234yf, R1234ze (E), R1234ze (Z), and R1234zd (E) have replaced older alternatives like R407f and R404A. These newer refrigerants have significantly lower global warming potential compared to their traditional counterparts. In this study, the performance of these modern refrigerants in marine applications was assessed analytically, focusing on their Coefficient of Performance (COP). The analysis involved using seawater in the condenser circuit to facilitate heat exchange during the refrigeration cycle. Parametric analyses were conducted at various temperatures with these next-generation refrigerants. The comparison considered factors like COP, safety, and environmental impact. Results indicated that R1234ze (Z) demonstrated superior COP performance compared to the other refrigerants. However, an increase in seawater temperature supplied to the system resulted in a reduction of up to 50% in COP. The study concluded that while modern refrigerants are more environmentally friendly, they show a slight decrease in COP performance.

Keywords: Marine refrigerants, COP, Refrigeration, Low GWP refrigerant

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## | 0067 | Role of Thermal Engineering in 3D Printing Technology: A Review

Rahul Mishra<sup>1, #</sup>, Suraj Kumar Bandhekar<sup>2</sup>, Kush Kumar Dewangan<sup>3</sup>, Sanjay G Sakharvade<sup>4</sup>, Sameer Singh<sup>5</sup>, Anant Kumar<sup>6</sup>

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#### **ABSTRACT:**

Thermal engineering plays a crucial role in enhancing the quality and reliability of 3D-printed products. This paper explores how thermal engineering principles impact 3D printing, influencing material behaviour, heat transfer, and thermal management strategies. Additive manufacturing (AM), commonly known as 3D printing, has transformed manufacturing by enabling rapid prototyping and customised production. However, the effectiveness and consistency of printed components largely depend on how heat is controlled throughout the process. The present paper highlights the significant contributions of thermal engineering to 3D printing technology, including advancements in thermal control systems and challenges in high-temperature printing. It also examines the integration of thermal models to improve printing precision. Additionally, we discuss the mechanical, thermal, and microstructural properties of composite materials, focusing on metalinfused polymers like polylactic acid (PLA) and acrylonitrile styrene acrylate (ASA). Key challenges such as porosity, optimising thermal conductivity, and managing anisotropic behaviour are addressed, along with potential solutions through improvements in printing parameters and post-processing techniques.

Keywords: 3D Printing, Solidification, Heat Transfer, Composite Material, Cement Technology, etc

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# | 0095 | Stability analysis of flashing-driven natural circulation loops: Influence of orientation of heaters and coolers

Kush Kumar Dewangan<sup>1, #</sup>, Sanjay G Sakharwade<sup>1</sup>, Sameer Singh<sup>2</sup>, Rahul Mishra<sup>3</sup>, Suraj Bandhekar<sup>4</sup>, Anant Kumar<sup>5</sup>

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#### **ABSTRACT:**

A steady state model has been developed to study the operation of a flashing driven natural circulation loop at low-pressure conditions. The heat transport capacity of the natural circulation loop (NCL) is usually low and depends strongly on the length of the riser. As riser length increases, the tendency of flashing in the adiabatic section of the riser increases as a result of an increase in the density difference between the riser and the downcomer. The position or orientation of the heater and the cooler can be manipulated to modify the driving force for the circulation in the loop. Thereby, the hydrodynamic and heat transport characteristics of the loop can be controlled. One-dimensional two-phase homogeneous equilibrium model (HEM) has been considered for estimating the void fraction in the two-phase region. Circulation with flashing and without flashing in the adiabatic section of the riser has been compared for the steady state condition. This study focuses on the influences of cooler and heater orientations on the performance of flashing driven natural circulation loops. Based on the presented model, it can be predicted that, at low operating pressure, flashing at the unheated riser section has a significant impact on the NCL's performance. The full paper reports the variation of void fraction, circulation rate, and the limit of operation over a range of working parameters.

Keywords: flashing driven natural circulation loop, two-phase flow, Ledinegg type instability.

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## | 0098 | Topology Optimization and Development of Bio-Degradable ABACA Polymer Composite Leaf-Spring for Electric Vehicles

Avi Raj Singh<sup>1, #</sup>, Abhinav Shrivastava<sup>2</sup>, Mahima Nilmarkar<sup>3</sup>, Ronit Ranjan<sup>3</sup>, Yash Malvai<sup>4</sup>, Manish Sah<sup>5</sup>

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#### **ABSTRACT:**

This research focuses on the topology optimization and development of a bio-degradable ABACA polymer composite leaf-spring for electric vehicles, aiming to enhance performance while promoting sustainability. The study integrates advanced computational techniques and material science principles to design an optimized, lightweight, and structurally efficient leaf-spring.

To achieve optimal design efficiency, topology optimization techniques are employed using a gradient-based algorithm that iteratively removes unnecessary material while maintaining structural integrity. The optimization framework defines the design domain, objective function, and constraints to ensure minimal weight and maximum stiffness. The study then transitions to computational simulations, leveraging Simscale's cloud-based platform to conduct stress analysis, vibration analysis, and deformation evaluations under real-world loading conditions.

The material selection process centers around ABACA polymer composites, known for their high strength-to-weight ratio and biodegradability. The formulation and manufacturing procedures integrate polymer infusion and layering techniques to develop a robust composite structure.

Keywords: Topology Optimization, Bio-Degradable ABACA Polymer Composite, Computational Techniques, Material Science Principles

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## | 0105 | A Generative AI-Based CAPP Framework for Real-Time Adaptive Manufacturing

Sameer Singh<sup>1#</sup>, Anant Kumar<sup>1</sup>, Kush Kumar Dewangan<sup>2</sup>, Sanjay G Sakharwade<sup>3</sup>, Rahul Mishra<sup>4</sup>, Suraj Bandhekar<sup>4</sup>

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#### **ABSTRACT:**

Smart Manufacturing (SM), a cornerstone of Industry 4.0 (I4.0), enhances autonomy across cyberphysical systems on the production floor. Connectivity, powered by Digital Twinning (DT), the Industrial Internet of Things (IIoT), Cloud Computing, and advanced sensors, facilitates real-time monitoring and decision-making. DT plays a pivotal role in production and operations management by integrating with a novel CAPP-GPT (Computer-Aided Process Planning—Generative Pretrained Transformer) and production scheduling framework. This hybrid methodology addresses shop floor disruptions by enabling self-healing capabilities at the micro-CAPP level, dynamically adjusting process parameters and toolpaths based on real-time process signature data. Inspired by advancements in NLP and LLMs like ChatGPT, the framework analyzes CAD models and blueprints using a combination of operations research and predictive analytics for setup planning, operation sequencing, and grouping. A hybrid approach incorporating Optimization, Logical Analysis of Data, and Machine Learning (ML) is employed to heuristically generate and modify process plans. At the macro-CAPP level, integration with delayed product differentiation, lot-sizing, and transfer line balancing supports batch production in Hybrid Manufacturing (HM) and Smart Assembly systems.

Keywords: CAPP-GPT, Macro-CAPP, Scheduling, Micro-CAPP, Smart Manufacturing, Maintenance 4.0, Quality 4.0, Machine Learning

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# | 0123 | Developments in wire arc additively produced Al-Zn-Mg-Cu alloys: improving mechanical characteristics, refining grains, and metallurgical flaws.

Anant Kumar<sup>1, #</sup>, Sameer Singh<sup>1</sup>, Suraj Kumar Bandhekar<sup>2</sup>, Kush Kumar Dewangan<sup>3</sup>, Sanjay G Sakharwade<sup>4</sup>, Rahul Mishra<sup>5</sup>

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#### **ABSTRACT:**

Wire Arc Additive Manufacturing (WAAM) is a promising technique for metal additive manufacturing due to its high deposition rate, cost-effectiveness, and ability to produce large-scale components. Aluminium alloys, particularly those in the Al-Zn-Mg-Cu system, have gained significant attention due to their high strength-to-weight ratio, excellent mechanical performance, and broad applicability in aerospace, automotive, and military industries. However, several challenges limit the widespread adoption of WAAM technology for high-performance alloys. One major issue is the presence of metallurgical defects, such as porosity and cracking, which can compromise the structural integrity and performance of the final components. Additionally, achieving grain refinement is crucial for enhancing the material's strength, ductility, and resistance to fatigue and corrosion. Current research focuses on developing strategies to mitigate defects, promote grain refinement, and improve the mechanical properties of WAAM-fabricated Al-Zn-Mg-Cu components, including optimizing process parameters, exploring post-processing treatments, and incorporating innovative alloy design or reinforcement techniques.

Keywords: Al-Zn-Mg-Cu alloys, Wire arc additive manufacturing, Metallurgical defects, Cracking, Refining grains.

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# | 0134 | Study on the effectiveness of Non-Newtonian fluid-based Speed Braker

Nivesh Agrawal<sup>1,#</sup>, Manoj Kumar Soni<sup>1</sup>, Ishwar Prasad Sahu<sup>1</sup>, Anand Kumbhare<sup>1</sup>, Y. Venkat Ramana<sup>1</sup>

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#### **ABSTRACT:**

The study investigates the effectiveness of non-Newtonian fluid (NNF) based speed breakers as an innovative solution to enhance road safety and traffic control. Traditional speed breakers, while effective in reducing vehicle speed, often cause discomfort to drivers and can lead to vehicle damage over time. Non-Newtonian fluids, with their unique property of viscosity change under stress, offer a promising alternative. This research focuses on the development, testing, and analysis of a speed breaker prototype utilizing NNF technology. The study explores the fluid's behaviour under varying vehicle loads and speeds, the mechanical design of the speed breaker, and its potential benefits compared to conventional rigid speed bumps. The results show that the NNFbased speed breaker provides a smoother driving experience while still effectively reducing vehicle speed. Furthermore, the adaptive nature of the non-Newtonian fluid allows for variable resistance, potentially enhancing the comfort and safety of road users. This study also highlights the environmental sustainability of the proposed system, as NNF-based speed breakers can be designed with eco-friendly materials and components. The findings suggest that NNF-based speed breakers could offer a viable solution to modernizing traffic control systems, balancing efficiency, safety, and user experience. Further research is recommended to refine the system and evaluate its performance under diverse environmental conditions.

Keywords: Non-Newtonian fluid, speed breaker, road safety, traffic control, vehicle speed, adaptive resistance, sustainable design.

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## | 0161 | Generation of Low Carbon Steel: Synthesis and Characterization

Anand Kumbhare<sup>1, #</sup>, Manoj Soni<sup>1</sup>, Nivesh Agrawal<sup>1</sup>, Ishwar Sahu<sup>1</sup>, Venkat Ramana<sup>1</sup>, Gauri Kumbhare<sup>2</sup>

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#### **ABSTRACT:**

In the present investigation, multiphase microstructures containing a combination of ferrite, martensite, retained austenite and carbides have been produced by altering the cooling rate in low alloy steels. The mechanical properties have been evaluated and correlated with ensuing microstructural features. The quench interruption temperature was optimized with consideration of the ideal carbon concentration in untransformed austenite after partitioning to lower the Ms temperature to room temperature. After partitioning at an appropriate temperature, a significant fraction of austenite was retained through the enrichment of carbon into the untransformed austenite. Three samples have been heat treatment by following the cycle of quenching and partitioning. The samples were then compared with each other. In the first set, before going for Q & P treatment, samples were annealed. Then Q& P temperature was taken for 450 C and 350 C. Also, Q & P has been performed for fully and partially austenitization sample at 450 C. It has been observed that a significant reduction in grain size can be observed after Q&P heat treatment of the steel. Also, the hardness shows an efficient increase in comparison to annealed low carbon steel. This also gives evidence of the development of advanced high strength low carbon steel. Even though the less Q & P temperature shows more amount of martensite in the martensite which leads to high hardness then higher Q & P temperature. Austenitization temperature also have an effect on the mechanical properties as complete austenitization leads to have higher amount of martensite and retained austenite then partial austenitization sample, hence the increase in hardness can be observed in fully austenized Q&P sample.

Keywords: Quenching and Partitioning; low carbon steel; Microstructure; Hardness; Grain size analysis

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## | 0164 | Artificial Intelligence in SOLIDWORKS: Applications and Impacts

Sanjay G Sakharwade<sup>1,#</sup>, Kush Kumar Dewangan<sup>1</sup>, Suraj Bandhekar<sup>1</sup>, Rahul Mishra<sup>1</sup>, Sameer Singh<sup>1</sup>, Anant Kumar<sup>1</sup>

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#### **ABSTRACT:**

The integration of Artificial Intelligence (AI) and Machine Learning (ML) into SOLIDWORKS has revolutionized mechanical engineering workflows, enabling unprecedented efficiency, creativity, and precision in product design. This paper explores SOLIDWORKS' AI-driven tools, their applications, and their transformative impact on the field. SOLIDWORKS 2025 introduces Aura AI, a context-aware assistant embedded directly into the CAD environment. Aura automates repetitive tasks, generates design alternatives, and provides real-time regulatory compliance insights, allowing engineers to focus on innovation. AI reduces repetitive tasks, allowing engineers to dedicate 40% more time to creative problem-solving. However, human oversight remains critical. SOLIDWORKS aims to expand industry-specific AI customization, particularly for aerospace and medical devices, while improving predictive maintenance algorithms using IoT sensor data. This synergy positions SOLIDWORKS as a leader in smart manufacturing, driving innovation while maintaining the critical role of engineering expertise.

Keywords: Solidworks; digital manufacturing; artificial intelligence; industry 4.0

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## | 0200 | AI-Driven Supplier Selection Using AHP and TOPSIS Approaches for Optimized Supply Chain Management

Chandra Shekhar Nagendra<sup>1, #</sup>, Roshan Dutt Kashyap<sup>2</sup>, Lakhwinder Kaur<sup>3</sup>, T M Swathy<sup>4</sup>, Megha Kataria<sup>5</sup>, B Laxman Rao<sup>6</sup>

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#### **ABSTRACT:**

In the modern globalized and digitally connected marketplace, the selection of suitable contractors is a critical strategic decision with far-reaching implications across the supply chain. Conventional supplier evaluation methods, though beneficial, often prove inadequate when dealing with ambiguity, scarce information, and subjective inputs. Incorporating artificial intelligence into these processes can significantly improve the efficiency, accuracy, and responsiveness of decision-making. This research explores the integration of AI with established supplier selection models namely AHP and TOPSIS, to offer supply chain managers a robust framework for comparative assessment and enhanced strategic choices. Application of AI to AHP and TOPSIS results in more adaptive, data-driven evaluations that strengthen strategic sourcing decisions in dynamic supply chain environments; and the ability to process complex datasets and generate optimized supplier rankings with greater reliability and speed.

Keywords: Supplier Selection, AHP, TOPSIS

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## | 0230 | HEAT EXCHANGER MODIFICATION

Rajkumar Rai<sup>1#</sup>, Pranjal Kumar Pandey<sup>2</sup>, Shreyash Suman<sup>3</sup>, Suraj Bandhekar<sup>4</sup>, Taha Qamer<sup>5</sup>

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#### **ABSTRACT:**

Heat exchangers are integral to industrial processes involving thermal energy exchange. Traditional designs such as the shell-and-tube configuration often suffer from suboptimal thermal performance, fouling, and pressure drops. This paper investigates cost-effective passive modification techniques including helical baffles, vortex generators, and nanofluids for enhancing heat exchanger performance. The objective is to optimize heat transfer without significant penalties in pressure drop or system complexity. Computational Fluid Dynamics (CFD) simulations coupled with experimental validation are used to analyse the effects of these modifications. Results show up to 40% improvement in heat transfer coefficient and over 35% increase in Nusselt number with limited increase in pressure drop.

The study concludes that retrofitting existing exchangers with such enhancements is a practical approach to improving thermal systems. These findings suggest that integrating nanotechnology and geometric modifications can lead to significant energy savings and improved process reliability in various industrial applications.

Keywords: Heat exchangers, passive enhancement, helical baffles, vortex generators, nanofluids, Computational Fluid Dynamics (CFD), Nusselt number, heat transfer coefficient, retrofitting, thermal performance.

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## | 0260 | Compilation of Mechanical Properties of Kenaf-Reinforced Polymer Composites with Varying Fibre Content and Matrices

Aditya Rajput<sup>1,#</sup>, Shourya Chandrakar<sup>2</sup>, Ansh Mishra<sup>2</sup>, Md Muzaffar Ansari<sup>2</sup>, Agnivesh Kumar Sinha<sup>3</sup>, Ram Krishna Rathore<sup>3</sup>

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#### **ABSTRACT:**

Kenaf fibre has emerged as a promising natural reinforcement in polymer composites due to its sustainability, cost-effectiveness, and favorable mechanical properties. This review compiles and analyzes experimental data on a wide variety of kenaf-reinforced polymer composites to evaluate their mechanical performance. The composites studied include single and hybrid reinforcements combined with matrices such as epoxy, polyester, polyurethane, polylactic acid, and polypropylene. Mechanical properties such as tensile strength, flexural strength, impact strength, Young's modulus, and elongation at break were compared across different fibre loadings and composite formulations. The results indicate that the incorporation of kenaf fibres significantly enhances mechanical performance, particularly when combined with other reinforcements like glass fibre, banana fibre, or basalt. For example, hybrid kenaf-basalt epoxy composites demonstrated tensile strengths up to 150 MPa and impact strengths exceeding 29 kJ/m². Additionally, fibre loading was found to strongly influence mechanical behavior, with optimal ranges varying by matrix type. Notably, polylactic acid and epoxy-based systems generally showed superior strength and stiffness. This comprehensive dataset highlights the potential of kenaf fibre composites for structural and semi-structural applications in automotive, construction, and consumer product sectors.

Keywords: Polymer matrix composites; Structural applications; Mechanical properties; Sustainable materials; Reinforcement hybridization; Fibre-matrix compatibility

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## | 0262 | Advancing Material Frontiers with Lightweight High Entropy Alloys: A Review of Structure, Properties, and Potential

Ansh Mishra<sup>1,#</sup>, Shourya Chandrakar<sup>1</sup>, Aditya Rajput<sup>2</sup>, Md Muzaffar Ansari<sup>1</sup>, Agnivesh Kumar Sinha<sup>3</sup>, Ram Krishna Rathore<sup>3</sup>

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#### **ABSTRACT:**

Lightweight High Entropy Alloys (LWHEAs) represent a transformative class of materials designed for high-performance applications in aerospace, automotive, and defense sectors where weight reduction and mechanical integrity are critical. Unlike conventional alloys based on a single principal element, HEAs incorporate multiple principal elements—typically five or more—in near-equimolar ratios, resulting in high configurational entropy and the formation of stable solid-solution phases. LWHEAs integrate low-density elements such as aluminum, magnesium, lithium, or titanium, effectively reducing weight while preserving excellent mechanical strength, corrosion resistance, and thermal stability. These materials demonstrate superior specific strength and structural reliability under extreme conditions, often outperforming traditional light alloys like aluminum or titanium. The combination of high entropy effects, lattice distortion, and sluggish diffusion contributes to their unique behavior and long-term performance. This review examines the compositional design, synthesis methods, mechanical behavior, and potential applications of LWHEAs. The outcome of this review reveals that LWHEAs hold significant promise as next-generation structural materials, with ongoing research focused on tuning their microstructure for enhanced industrial applicability and mass production.

Keywords: High Entropy Alloys, Lightweight Materials, Structural Applications, Specific Strength, Alloy Design, LWHEAs

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## | 0269 | Advances in Mechanical Properties of Glass Fibre-Based Hybrid Composites: Influence of Bio and Nano Fillers

Shourya Chandrakar<sup>1,#</sup>, Ansh Mishra<sup>1</sup>, Aditya Rajput<sup>2</sup>, Md Muzaffar Ansari<sup>1</sup>, Agnivesh Kumar Sinha<sup>3</sup>, Ram Krishna Rathore<sup>3</sup>

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#### **ABSTRACT:**

This study presents a comprehensive analysis of the mechanical properties of various glass fibre-based composite materials. A wide range of hybrid composites were analyzed, including combinations with coir, charcoal, sisal, hemp, basalt, cotton, carbon nanotubes (CNTs), graphene, and rice straw. These materials were evaluated for tensile strength, flexural strength, Young's modulus, impact strength, and flexural modulus, with fibre content varying across the samples. The results highlight the significant influence of fibre type and percentage on the mechanical performance. Notably, composites reinforced with graphene and carbon-based fillers exhibited enhanced mechanical properties, making them suitable for high-performance applications. On the other hand, natural fibre hybrids offered moderate strength with sustainability benefits. The choice of epoxy or thermoplastic matrix also impacted the material behavior. The findings contribute to the understanding of composite optimization and material selection for structural and industrial applications. This study provides valuable data for future research and helps in the design of cost-effective, lightweight, and high-strength composite materials suitable for diverse engineering uses.

Keywords: Glass fibre; composite materials; mechanical properties; graphene reinforcement; hybrid fibre

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## | 0274 | Advancing Material Frontiers with High Entropy Alloys: A Review of Structure, Properties, and Potential

Md Muzaffar Ansari <sup>1,#</sup>, Shourya Chandrakar<sup>1</sup>, Aditya Rajput<sup>2</sup>, Ansh Mishra<sup>1</sup>, Agnivesh Kumar Sinha<sup>3</sup>, Ram Krishna Rathore<sup>3</sup>

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#### **ABSTRACT:**

High Entropy Alloys (HEAs) represent a revolutionary class of materials engineered for high-performance applications across aerospace, automotive, energy, and defense industries, where mechanical integrity, thermal stability, and corrosion resistance are critical. Unlike conventional alloys based on one or two principal elements, HEAs are composed of five or more principal elements in near-equimolar ratios, resulting in elevated configurational entropy and the stabilization of simple solid-solution phases. This unique compositional strategy leads to exceptional mechanical strength, wear resistance, and structural stability, even under extreme environmental conditions. The synergistic effects of high entropy, severe lattice distortion, sluggish diffusion, and the cocktail effect contribute to the remarkable physical and chemical properties observed in HEAs. This review explores the principles of alloy design, fabrication techniques, microstructural evolution, and mechanical performance of HEAs. It further highlights the broad potential of HEAs as next-generation structural materials and functional components, with particular emphasis on their adaptability through compositional tuning and advanced processing techniques. Continued research is essential for optimizing HEAs for mass production and application-specific performance.

Keywords: High Entropy Alloys, Advanced Materials, Structural Applications, Mechanical Properties, Solid-Solution Strengthening

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## |0295|Advances in Mechanical Properties of Jute Fibre -Reinforced Polymer Composites: A Comprehensive Review on Hybridization and Nano Fillers Effects

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#### **ABSTRACT:**

Jute fibre – reinforced polymer composites have gained substantial attention in recent years due to their biodegradability, low cost, and acceptable mechanical performance. This review paper summarizes and analyses the mechanical properties – such as tensile strength, flexural strength, modulus, impact strength, fibre content and elongation at break – of jute-based composites with various matrices and modifications. A comparative study is presented between pure jute composites, jute –glass hybrid composites, and jute composites modified with nanofillers such as carbon nanotubes. The effects of fibre content and matrix combinations on the overall performance are explored to assess the optimal configuration for different engineering applications. Among studied composites, hybrid systems like HPMC (S-glass+jute) and nano enhance jute composites demonstrated significant improvement in impact strength and flexural properties, indicating the benefits of hybrid reinforcement and nano – integration. Additionally, high- performance jute composites showed potential in replacing synthetic fibre composites for structural applications. Furthermore, the combination of jute with EFB and advanced epoxy formulations yields promising alternatives to conventional composites. This study provides a holistic comparison to guide the development of high-performance, eco-friendly composites materials.

Keywords: Jute Fibre-Reinforced Composites; Mechanical Properties; Nanofillers; Flexural Strength; Carbon Nanotubes

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## | 0331 | A review paper on Natural Bamboo Fibre Hybrid Composites

B Laxshaman Rao<sup>1, #</sup>, Megha Kataria<sup>2</sup>, C.S. Nagendra<sup>3</sup>, Roshan Datt Kashyap<sup>4</sup>,
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#### **ABSTRACT:**

In recent years, there has been rapid progress in research and development in the field of bamboo fibre composites due to their excellent formability, abundance, sustainability, and cost-effectiveness. Bamboo fibre is a natural material that is biodegradable and offers significant potential as a future alternative to synthetic fibres. Its wide availability, low cost, and year-round growth — largely unaffected by seasonal variations — make it a highly attractive resource. The use of bamboo fibre presents an eco-friendly solution to environmental challenges and offers a viable business opportunity as reliance on petroleum-based synthetic fibres continues to decline.

This work focuses on the mechanical and chemical properties of bamboo fibre, highlighting its core values and benefits. Based on these properties, the unique characteristics and practical applications of bamboo are explored. The indications of its usage in various sectors have also been analyzed, establishing bamboo fibre as a promising material for sustainable development.

Keywords: Keywords: Hybrid; Fibre; Bamboo; Composites; Eco-friendly

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## | 0332 | Designing and Optimization of Rail Wheel Profile Using CAD software and AI.

Megha Kataria<sup>1, #</sup>, B. Laxshman Rao<sup>2</sup>, Roshan Dutt Kashyap<sup>3</sup>, Chandra Shekhar Nagendra<sup>4</sup>, Lakhwinder Kaur<sup>5</sup>, T M Swathy<sup>6</sup>

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#### **ABSTRACT:**

The performance, safety, and efficiency of modern railway systems are significantly influenced by the geometry of the rail wheel profile, which governs critical aspects such as vehicle dynamics, ride comfort, energy consumption, Artificial Intelligence (AI) has emerged as a transformative tool for rail wheel profile optimization. This research explores the application of AI methodologies including machine learning (ML), deep learning, and optimization algorithms to model, predict, and optimize the evolution and performance of rail wheel profiles under varying conditions. The proposed AI-driven framework begins with comprehensive data acquisition from trackside monitoring systems, onboard sensors, and historical maintenance records. Using this data, supervised learning models such as Random Forests, Gradient Boosting Machines, and Neural Networks—are trained to predict profile wear over time and under diverse operating scenarios. A digital twin of the wheel-rail system is developed to simulate and visualize the impact of different profile geometries on system behavior, enabling engineers to assess design trade-offs before physical implementation.

Keywords: Rail Wheel Profile, Artificial Intelligence (AI), Machine Learning, Predictive Maintenance, Reinforcement Learning, Wear Prediction,

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### | 0378 | Automatic brake failure indicator

Manish Kumar Rajput<sup>1, #</sup>, Ayush Raj<sup>1</sup>, Akash gaurav<sup>1</sup>, Alok kumar<sup>1</sup>, Gunjan Kumar <sup>1</sup>, Ronak Sinha<sup>1</sup>

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#### **ABSTRACT:**

The Automation Brake Failure Indicator is a safety-critical system designed to detect, diagnose, and alert operators to brake malfunctions in automated or semi-automated vehicles and machinery. This system enhances reliability by continuously monitoring brake performance parameters such as hydraulic pressure, electronic braking signals, and mechanical feedback. Upon detecting anomalies such as pressure drops, signal failure, or response delays, the indicator system promptly generates alerts through visual, auditory, or digital interfaces. Integrating such a system improves operational safety, reduces response time to mechanical failures, and supports preventive maintenance. This paper discusses the design architecture, fault detection algorithms, sensor integration, and practical applications of the automation brake failure indicator in industrial and transportation sectors.

Keywords: Sensor Integration, Brake Monitoring System, Safety Alert System, Intelligent Diagnostics, Vehicle Automation, Real-Time Monitoring

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# | 0382 | A review paper on Heat Transfer Augmentation Using Imbricated Dual Twisted Tapes.

Roshan Datt Kashyap<sup>1,#</sup> C.S.Nagendra<sup>2</sup> , T.M.Swathy<sup>3</sup> , Lakhwinder kaur<sup>4</sup> , B Laxshaman Rao<sup>5</sup>, Megha Kataria<sup>6</sup>

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#### **ABSTRACT:**

Al2O3 in water as nanofluid was employed for heat transfer augmentation using together with imbricated dual twisted tapes. The study encompassed Reynolds numbers from 2800 to 18,200, imbricated dual twisted tapes with overlapped twist ratios (yo/y) of 1.5, 2.0 and 2.5 and nanofluids with Al2O3 volume concentrations (f) of 0.05%, 0.15% and 0.25%. The experimental and numerical results indicated that IDTs(imbricated dual twisted tapes)with smaller overlapped twisted ratio delivered a higher turbulent kinetic energy and better swirl intensity. Mostly in heavy industries with heat exchangers these techniques are used. The smallest twist ratio of IDTs 1.5 enhanced heat transfer rates up to 76.75%, thermal performance up to 1.08 times and friction factor by 4.35 times as compared to normal plain tube.

Keywords: Heat exchanger tube Imbricated dual twisted tapes Heat transfer enhancement Al2O3 /water nanofluid

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## | 0385 | Analysis of PEM Fuel Cell Performance under Multiple Loading Situations

Ishwar Prasad sahu<sup>1, #</sup>, Manoj Soni<sup>2</sup>, Nivesh Agrawal<sup>3</sup>, anand kumbhare<sup>4</sup>, Y Venkat ramanna<sup>5</sup>

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#### **ABSTRACT:**

The effects of different operating parameters on the performance of a 1200W polymer electrolyte membrane (PEM) fuel cell have been studied experimentally using pure hydrogen (H2) on the anode side and air on the cathode side. The experimental results are obtained in the form of polarization curves for two kinds of electronic loading such as constant current mode and constant power mode. Various characteristic curves of the fuel cell, such as voltage vs. current density, power vs. current density, current vs. H2 flow, efficiency vs. current density, efficiency vs. temperature and efficiency vs. pressure are determined experimentally. The experimental results are compared with the theoretical determined values. For the theoretical calculation of voltage, the Tafel equation and Nernst equation are used. The effective exchange current density at any temperature or pressures is determined by the Butler-Volmer equation. The comparison shows good agreements between the theoretical and the experimental data. A performance study on PEM fuel cells under varying load conditions reveals that factors like temperature, pressure, and humidity significantly impact performance, especially under dynamic load changes. The study shows that increasing temperature, pressure, and humidity generally enhances performance by improving reaction kinetics and reducing mass transport limitations. However, excessively high humidity can lead to flooding, hindering performance. Load changes themselves can introduce transient fluctuations in parameters like stoichiometry, temperature, and humidity, accelerating fuel cell degradation.

Keywords: Polymer electrolyte membrane fuel cell (PEMFC), constant power mode and constant current mode Nernst and Tafel equation Butler-Volmer equation.

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## | 0386 | Optimization of Differential Gearbox Weight for EV's

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#### **ABSTRACT:**

The transition toward electric mobility has heightened the demand for lightweight and efficient drivetrain components. This research focuses on the design optimization and material analysis of a differential gearbox tailored specifically for electric vehicles (EVs). Traditional materials like cast iron and steel, though mechanically robust, significantly add to the vehicle's weight, reducing energy efficiency and overall performance. This study explores the use of lightweight alternatives such as EN8, EN19, and 20MnCr5 steels to reduce gearbox weight without compromising structural integrity. A detailed CAD model of the differential was developed using SolidWorks, and structural performance under varying torque conditions was analysed using ANSYS Workbench. Finite Element Analysis (FEA) was conducted to evaluate stress distribution, deformation, and modal behaviour, ensuring the system meets mechanical and thermal performance requirements. Results indicate a 15% weight reduction in the gearbox casing, enhanced durability, and improved energy efficiency. The optimized design presents a promising solution for lightweight, high-performance differentials in modern electric vehicles.

Keywords: Electric vehicles (EVs), Differential gearbox, Lightweight, Design optimization, Finite Element Analysis (FEA)

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## | 0387 | Robot to Clean Roof Top Solar Panel

Manoj Kumar Soni<sup>1, #</sup>, Ishwar Prasad Sahu<sup>2</sup>, Nivesh Agrawal<sup>3</sup>, Anand Kumbhare<sup>4</sup>, Y.Venkat Ramana<sup>5</sup>

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#### **ABSTRACT:**

Solar energy is the most abundant source of energy for all the forms of life on the planet Earth. It is also the basic source for all the sources of energy except Nuclear Energy. But the solar technology has not matured to the extent of the conventional sources of energy. It faces lots of challenges such as high cost, erratic and unpredictable in nature, need for storage and low efficiency. This project aims at increasing the efficiency of solar power plants by solving the problem of accumulation of dust on the surface of solar panel which leads to reduction in plant output and overall plant efficiency. It proposes to develop a Solar Panel Cleaning System which could remove the accumulated dust on its surface on a regular basis and maintain the solar power plant output. The system is a robotic system which could move autonomously on the surface of solar panels.

Keywords: solar panel, cleaning efficiency, light weight

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## |0393| Review on Advancement in Thermophysical Properties of Nano- Enhanced Phase Change Materials for Energy Storage Application

Taslim Bano<sup>1,#</sup>, Kunal Das<sup>1</sup>, Lavish Patle<sup>2</sup>, MD Aman<sup>4</sup>, Agnivesh Kumar Sinha<sup>3</sup>, Ram Krishna Rathore<sup>3</sup>

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#### **ABSTRACT:**

Nano-enhanced phase change materials (NePCMs) have emerged as transformative solutions for thermal energy storage, addressing critical challenges in energy efficiency and heat management. This review synthesizes advancements in thermophysical properties of NePCMs, highlighting the integration of nanoparticles such as SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, graphene, and carbon nanotubes (CNTs) into organic PCMs (e.g., paraffin, fatty acids), inorganic salts (e.g., CaCl<sub>2</sub>·6H<sub>2</sub>O, Na<sub>2</sub>SO<sub>4</sub>·10H<sub>2</sub>O), and eutectic blends. Key findings reveal that nanoparticles significantly enhance thermal conductivity while maintaining melting points and enthalpy Synthesis routes like melt mixing and sol-gel dominate due to scalability and homogeneity, though ultrasonic dispersion shows promise for carbon-based additives. Widely adopted applications include building thermal regulation (paraffin-based composites), solar energy storage (inorganic salt hydrates), and electronics cooling (eutectic blends with CNTs), driven by their tailored phase transition temperatures and stability. Future research should optimize nanoparticle to mitigate sedimentation, explore hybrid nanoparticles, and develop eco-friendly synthesis methods. Innovations in encapsulation and hybrid systems could further elevate energy density and cyclability, positioning NePCMs as pivotal for sustainable energy systems and climate-responsive technologies.

Keywords: NePCMs; Thermophysical Properties; Thermal Conductivity Enhancement; Organic/Inorganic PCMs; Melt Mixing; Industrial Scalability

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## | 0428 | Advancement in Mechanical Properties of Carbon Fiber- Based Polymer Composites: A Comprehensive Review on Nano Filler Effect

Kunal Das<sup>1,#</sup>, Taslim Bano<sup>1</sup>, MD Aman<sup>4</sup>, Lavish Patle<sup>2</sup>, Agnivesh Kumar Sinha<sup>3</sup>, Ram Krishna Rathor<sup>3</sup>

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#### **ABSTRACT:**

This study presents a comprehensive analysis of mechanical properties of various carbon Fiber based composite materials. A wide range of polymer composites were analysed. Carbon nano tube (CNT), graphene nano plates, these materials were evaluated for tensile strength, flexural strength, Young's modulus, impact strength, with Fiber contents varying across the samples. The result showed a significant influence in mechanical properties of different Fiber composites. Notably the composites with epoxy polymer showed the highest tensile strengths, making them suitable for being used in aerospace, automotive, sports equipment, and various other sectors. The findings contribute to understanding of composite optimization and material selection for structural and industrial applications. This study provides valuable data for future research and helps in the design of cost-effective lightweight and high strength composite materials suitable for diverse engineering uses.

Keywords: Carbon Fiber reinforced composites; mechanical properties; Nanofillers; Tensile strength; Impact strength; Flexural strength; Carbon Nano tubes; Elongation at break

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### | 0435 | Innovation for sustainable Development

Lavish Patle<sup>1, #</sup>, Taslim Bano<sup>1</sup>, Kunal das<sup>1</sup>, MD Aman<sup>1</sup>, Ram Krishna Rathore<sup>1</sup>, Agnivesh Kumar Sinha<sup>1</sup>

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#### **ABSTRACT:**

The International Conference on Innovations in Mechanical, Automobile, and Mining Technology for Sustainable Development was organized to explore advanced technological solutions aligned with global sustainability goals. It brought together international experts, researchers, academicians, and industry leaders to share knowledge, present innovations, and foster collaboration in the fields of mechanical, automobile, and mining engineering.

The conference aimed to promote sustainable practices through technological advancement and interdisciplinary research. In mechanical engineering, discussions included renewable energy systems, smart manufacturing, and energy-efficient machines. Automobile technology sessions focused on electric and hybrid vehicles, emission reduction, and intelligent transport systems. Mining technology sessions emphasized eco-friendly mining, automation, waste management, and safety innovations.

Experts also highlighted the integration of Artificial Intelligence (AI), Internet of Things (IoT), and robotics as essential tools for modern, sustainable engineering solutions. Keynote speeches and technical paper presentations helped in identifying future trends and practical applications.

Keywords: Sustainable Development, Mechanical Engineering, Automobile Technology, Mining Technology, Renewable Energy, Electric Vehicles, Emission Control.

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## | 0475 | Thermophysical Properties of Encapsulated Phase Change Materials: A Comprehensive Review

Shubh Raj Gupta<sup>1, #</sup>, Om Panday<sup>2</sup>, Roshan Chandraker <sup>3</sup>, Rishabh Shukla<sup>4</sup>,

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#### **ABSTRACT:**

The review paper is a critical review of thermophysical properties of encapsulated phase change materials (PCMs) and their use in the development of next-generation thermal energy storage and management technology. Encapsulated PCMs, in which the phase change material is encapsulated in micro- or nano-scale capsules, possess enhanced thermal stability. The review paper is a systematic critical review of encapsulated phase change PCMs and their use in the development of next-generation thermal energy storage and management technology.

The paper provides an overview of recent progress in measurements and characterization of the principal thermophysical properties such as thermal conductivity, latent heat capacity, specific heat, and density for different encapsulation processes such as microencapsulation, nanoencapsulation, and core-shell architecture. The effects of encapsulation materials, shell structure, and synthesis routes on the thermophysical behaviour of PCMs are critically evaluated. The review also provides an overview of the effects of the aforementioned properties on applications towards energy-efficient buildings, thermal management of electronics, renewable energy systems, and industrial heat recovery.

Keywords: Phase Change Materials, Encapsulated PCMs, Thermophysical Properties, Thermal Conductivity, Latent Heat, Specific Heat

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## | 0477 | Investigation on Mechanical Properties of Sisal Polymer Composites

Rishabh Shukla<sup>#1</sup>, Shubh Raj Gupta<sup>2</sup>, Om pandey<sup>3</sup>, Roshan Chandraker<sup>4</sup>, Agnivesh Kumar Sinha<sup>5</sup>,Ram Krishna Rathore<sup>5</sup>

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#### **ABSTRACT:**

The main objective of the current work is to study and analysis the mechanical properties of the natural sisal fibre with different polymer composites. A large number of different composites were used such to study the change in the mechanical properties of the sisal fibre such as jute, glass, mustard cake, polyester, pipe needles, human hair, palm leaf and hemp. The study and analysis include key parameters such as fibre content, impact strength, flexural strength, tensile strength, young's modulus and elongation at break of the sisal and composites mixture. Varying fibre content with the same polymer composites revealed a significant influence change in the mechanical performance. The performance also depends upon the type of composites used accordingly, this may increase its properties or decrease them to. The findings contribute to the understanding of composite optimization and material selection for structural and industrial applications. This study provides valuable data for future research and helps in the design of cost-effective, lightweight, and high-strength composite materials suitable for diverse engineering uses.

Keywords: Sisal fibre; polymer composites materials; mechanical properties; fibre content Performance.

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## | 0478 | Aluminium metal foam: structural innovations and future prospects

Roshan Chandraker<sup>1, #</sup>, Om Panday<sup>2</sup>, Rishabh Shukla<sup>3</sup>, Shubh Raj Gupta<sup>4</sup>, Ram Krishna Rathore<sup>5</sup>, Agnivesh Kumar Sinha<sup>6</sup>

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#### **ABSTRACT:**

Aluminium metal foam is a lightweight, porous material gaining popularity for its unique properties, making it ideal for various industries. This review paper deals about how aluminium foam is made, its key features, and its growing uses in fields like aerospace, automotive, and construction. Created through methods like gas injection or melting processes, aluminium foam has a sponge-like structure that makes it strong yet lightweight, great for absorbing energy, insulating heat, and noise suppression (acoustic). Its adjustable porosity allows it to be moulded for specific needs, such as crash protection in cars or lightweight building panels. Recent improvements in production have made it stronger and easier to manufacture, tackling past issues like high costs. This paper looks at how production techniques affect its structure and performance, while exploring new trends, like using aluminium foam in eco-friendly designs and advanced composites (layers). Unlike conventional alternatives, aluminium foam champions sustainability and adaptability, heralding a new era of green engineering.

Keywords: Aluminium metal foam, Lightweight, Porous material, Aerospace, Automotive, Construction, Gas injection, Melting processes, Sponge-like structure

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## | 0480 | Titanium Foam: Redefining Biomedical Engineering and Performance-Driven Technologies

Om Panday<sup>1</sup>, Roshan Chandraker<sup>2</sup>, Rishabh Shukla<sup>3</sup>, Shubh Raj Gupta<sup>4</sup>, Ram Krishna Rathore<sup>5</sup>, Agnivesh Kumar Sinha<sup>6</sup>

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#### **ABSTRACT:**

Titanium foam, a lightweight and porous metallic material, is valued for its biocompatibility, robust mechanical properties, and resistance to corrosion, enabling its use across diverse industries. This review explores its critical applications in biomedical, aerospace, defence, and energy sectors, with a primary emphasis on biomedical innovations. Its porous architecture, typically with pore sizes ranging from 100 to 600 µm, supports osseointegration and tissue growth, making it ideal for orthopaedic implants, dental structures, regenerative scaffolds, and targeted drug delivery systems. Surface enhancements, such as hydroxyapatite coatings, further improve its bioactivity. In aerospace and defence, titanium foam's exceptional strength-to-weight ratio enhances airframe designs, turbine parts, military aircraft frameworks, and lightweight vehicle armour, boosting performance and longevity. In the energy sector, it functions as an electrode substrate in batteries, supercapacitors, and fuel cells, improving electrochemical efficiency for sustainable energy solutions. Nevertheless, challenges like achieving consistent porosity and high production costs hinder large-scale adoption.

Keywords: Titanium foam, lightweight, porous, biocompatibility, mechanical strength, corrosion resistance, biomedical, aerospace, defence, energy, osseointegration

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## | 0484 | A Review on the Edible Bio-Particulates-Filled Polymer Composites

Kinshuk Verma<sup>1,#</sup>, Ram Krishna Rathore<sup>2</sup>, Saurabh Chandraker<sup>3</sup>, Abhijeet Ganguly<sup>4</sup>

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#### **ABSTRACT:**

This literature review is focused on the progress and the uses of bio-particulate reinforcement in epoxy composites with an emphasis on the associated characterization techniques and a broad range of applications. The study begins by explaining the environmental degradation and remediation processes due to the application of convention reinforcement materials. It then goes on to suggest the development of bio-particulate reinforcements as a more sustainable alternative. This study, through a thorough analysis of the current literature, aims to articulate the novel developments and interests associated with the employment of bio-particulate reinforcements in epoxy composites, and the possible characterization strategies as well as potential utilization.

Keywords: Bio-particulate reinforcement, epoxy composites, characterization techniques, mechanical properties, sustainability, applications

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## | 0498 | Flexi Lumina Grip: A Multifunctional Ergonomic Writing Aid for Inclusive and Sustainable Learning

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#### **ABSTRACT:**

The Flexi Lumina Grip is an innovative, low-cost, and inclusive ergonomic writing aid designed to improve writing comfort and accessibility across diverse user groups. Engineered by a multidisciplinary team under AICTE IDEA Lab FDP, this novel device integrates a soft ergonomic grip, rotatable pen holder, and built-in LED illumination to address key challenges such as hand fatigue, poor lighting, and inflexible writing instruments. Its multifunctionality supports children, artists, students, senior citizens, and individuals with motor impairments.

With a production cost of just ₹10–15 per unit, the device ensures affordability and scalability, making it ideal for mass adoption in educational and rehabilitation settings. By combining universal tool compatibility, angle adjustment, and lighting into a single solution, it outperforms existing grips and writing aids. This product aligns with several UN Sustainable Development Goals (SDGs), including SDG 3 (Good Health), SDG 4 (Quality Education), and SDG 10 (Reduced Inequalities).

Flexi Lumina Grip has high commercial, academic, and patent potential. Future expansions may include digital sensors, rechargeable modules, and adaptive versions for digital styluses. This innovation exemplifies inclusive design and sustainable engineering, fostering well-being, education, and social equity..

Keywords: Ergonomic Writing Aid, Inclusive Education, Assistive Technology, LED-Integrated Grip, Sustainable Design, Low-Cost Innovation

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## | 0499 | Mechanical Insights into Biodegradable Natural Fiber Polymer Composites

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#### **ABSTRACT:**

The global demand for sustainable, lightweight, and high-performance materials has propelled research into biodegradable natural fiber-reinforced polymer composites (NFRPCs) as viable alternatives to synthetic fiber composites. This review explores the mechanical behavior—tensile strength, flexural performance, and impact resistance—of NFRPCs reinforced with fibers such as jute, flax, hemp, kenaf, coir, and sisal, embedded in biodegradable polymer matrices like polylactic acid (PLA), polyhydroxyalkanoates (PHA), and starch-based resins. The effects of fiber type, volume fraction, orientation, and surface treatments on interfacial bonding and overall mechanical performance are critically analyzed. Findings suggest that proper fiber treatment and alignment significantly enhance mechanical properties, making these composites suitable for semi-structural and structural applications in the automotive and construction sectors. The review also addresses the trade-offs between biodegradability and mechanical strength, highlighting current limitations and potential research directions. By correlating material characteristics with performance metrics, this paper aims to guide future material selection and design strategies for sustainable engineering applications.

Keywords: Natural fiber composites, biodegradable polymers, mechanical properties, tensile strength, flexural modulus, impact resistance, fiber treatment, sustainable materials, automotive applications, structural composites.

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10<sup>th</sup> International Conference

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### | 0007 | Technological Advancements in Induction Motors: Efficiency Improvements and Material Innovations

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#### **ABSTRACT:**

The study addresses the critical need to enhance the energy efficiency and performance of induction motors in industrial and automotive applications due to rising sustainability and energy conservation demands. The primary objective is to explore and evaluate technological advancements in voltage control mechanisms and material innovations that improve induction motor efficiency. The methodology involves experimental analysis using a 5HP squirrel-cage induction motor with a phase-triggered SCR voltage control system and evaluation of various winding materials, supported by power quality measurement instruments. Findings reveal that voltage regulation via SCR control effectively reduces stator losses and input power without compromising torque or speed, while material enhancements like silver windings and coppercoated rotors significantly boost efficiency and torque. A limitation of the study is the cost implications and scalability of premium materials like silver, which may affect widespread adoption.

Keywords: Motor Efficiency, SCR Voltage Control, Material Innovation, Stator Loss Reduction, Sustainable Motor Design, etc.

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## | 0009 | Proposed Novel Efficiency-Based PI Controller for Power Management in PV-Battery Systems

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#### **ABSTRACT:**

As the integration of photovoltaic (PV) energy and battery storage becomes more widespread in modern microgrids, the demand for efficient and intelligent power management solutions continues to grow. To address this need, this paper proposes a novel efficiency-driven Proportional-Integral (PI) controller designed to manage energy flow in PV-battery systems under dynamic operating conditions. The controller is developed with a focus on enhancing energy conversion efficiency, ensuring a swift response to load fluctuations, and maintaining system adaptability amidst varying solar irradiance and battery charge levels. The proposed controller employs a refined tuning strategy that improves dynamic performance, reduces steady-state errors, and optimizes energy usage. Unlike conventional PI controllers, this approach integrates efficiency-based metrics into the control logic, enabling smarter and more responsive decision-making. Additionally, intelligent optimization techniques are applied to fine-tune the controller parameters, enabling it to effectively handle nonlinearities and system uncertainties commonly encountered in renewable energy systems. Results indicate notable improvements in response time, power balance, and overall system efficiency when compared to traditional control methods. The outcomes demonstrate the controller's potential to enhance energy reliability and operational sustainability in PV-batterybased microgrids. This work contributes to the advancement of smart energy systems by presenting a scalable and high-performance control solution, suitable for both standalone and interconnected microgrid applications.

Keywords: PI controller, PV-battery systems, power management, energy efficiency, optimization, DC microgrids.

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## | 0038 | AI-Powered Web Application for Multiple Disease Prediction from Symptoms Using Flask and Machine Learning

Kamlesh Kumar<sup>1#</sup>, Avadhesh Kumar<sup>2</sup>, Debangana Das<sup>3</sup>, Shweta Pandy<sup>4</sup>, Onika Parmar<sup>5</sup> & V.Hemant Kumar<sup>6</sup>

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#### **ABSTRACT:**

Early and accurate diagnosis is a cornerstone of effective healthcare, playing a critical role in improving treatment outcomes and enhancing patient care. With the rapid growth of artificial intelligence (AI) and data-driven technologies, the healthcare sector is witnessing a transformative shift toward predictive and preventive solutions. This paper presents the design and implementation of an AI-powered web application capable of predicting multiple diseases based on user-reported symptoms. The system leverages machine learning algorithms trained on comprehensive medical datasets to analyze symptom inputs and generate probable disease predictions. Developed using the Flask web framework, the application provides a responsive, user-friendly interface that caters to both general users and medical professionals. Users can input a combination of symptoms, and the system processes this data to suggest the most likely medical conditions, offering a preliminary diagnostic assessment. For individuals, this tool serves as an accessible health checkup utility, encouraging early medical consultation when needed. For healthcare practitioners, it functions as a supportive decision-making aid, enhancing diagnostic efficiency and accuracy. The system incorporates various classification algorithms to ensure reliable prediction outcomes and continuous model improvement based on updated datasets.

Keywords: Disease Prediction, Machine Learning, Artificial Intelligence, Flask & Web Application, Healthcare Technology, Symptom Analysis, Early Diagnosis

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## | 0074 | 6G Wireless Networks: AI-Driven IoT, THz Communications, and Beyond 5G

Sneha C A<sup>1,#</sup>, Aditya Tiwari<sup>2</sup>, Anurag Sharma<sup>3</sup> Shaziya Islam<sup>4</sup>, Sandeep Bhad<sup>5</sup>, Rubi Kambo<sup>6</sup>

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#### **ABSTRACT:**

The rapid expansion of smart services powered by the Internet of Everything (IoE) has intensified the need for advanced wireless networks, pushing the boundaries of current 5G capabilities. While 5G demonstrates significant potential in supporting IoE applications, it falls short in meeting the full demands of next-generation intelligent systems. Consequently, the exploration of 6G wireless communication has become imperative to address the limitations of existing infrastructure. Integrating artificial intelligence (AI) into 6G networks is expected to resolve complex challenges related to network optimization and efficiency. Additionally, cutting-edge innovations such as terahertz (THz) and quantum communications are being investigated to enhance 6G performance. Future 6G networks must accommodate massive data-driven applications and an ever-growing user base, necessitating revolutionary advancements. This paper examines the latest developments in 6G technology, outlining key network requirements and critical enabling technologies while providing a comparative analysis of 5G and 6G use cases. It also explores emerging connectivity solutions, including holographic beam forming, AI-driven IoT networks, edge computing, and backscatter communications, aimed at empowering smart communities. Finally, the study identifies potential research directions to realize the vision of 6G-enabled IoT ecosystems, paving the way for transformative wireless communication

Keywords: 6G networks; Artificial Intelligence (AI); Internet of Everything (IoE); Terahertz (THz) communications; Quantum communications; Edge computing; Smart communities

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## | 0088 | Recent advances of novel nanomaterials for green and clean energy solar cells

Anil Kumar Verma<sup>1,#</sup>, Heera Sahu<sup>1</sup>, Vivek Dewangan<sup>1</sup>, Monika Gupta<sup>1</sup>

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#### **ABSTRACT:**

Demand for energy predicts that 30 TW of energy consumption will be needed by 2050. The current effort is on solar cell devices that are cost-effective and highly efficient with green and clean energy. The third and fourth generations' solar cell novel nanomaterials made from organic materials (polymers), nanotubes, silicon wires, organic dyes, quantum dots, conductive plastics, etc. have been synthesized, fabricated, characterized, and applied in the fields of green and clean energy. This review will provide an important reference resource for researchers in materials science and renewable energy who wish to learn more about how nanomaterials are used to create cheaper, more efficient green energy products. Thus, it will provide fundamental information about the properties and application of new low-cost nanomaterials for green and clean energy devices that shows how these novel nanomaterials are used to create more efficient solar cells and offers solutions to common problems related to the use of materials in the development of energy-related technologies.

Keywords: Nanomaterials, green energy, clean energy, solar cell.

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## | 0092 | Enhancing the Power Quality of three-phase transmission lines using a Fuzzy logic controller

Roopesh Kumar<sup>1,#</sup>, Manish Shukla<sup>2</sup>, Payal Nene<sup>3</sup>, Debshree Bhattacharya<sup>4</sup>, Shweta pandey<sup>5</sup>, V.Hemant Kumar<sup>6</sup>

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#### **ABSTRACT:**

As the nonlinearity increases due to the faults in transmission line, voltage sag, voltage swell and generation of harmonics that may cause system instability. Power quality of the system is affected by these nonlinearity. For the compensation of these problems in the transmission line generally SVC is used. Static VAr compensator is used for the compensation of transient instability. For better compensation we use Fuzzy logic controller with SVC in MATLAB/Simulink. Due to SVC with Fuzzzy logic controller it maintain the system stability under heavy load condition or light loading conditions.

Keywords: FACTS, fuzzy logic, reactive power, SVC, voltage stability

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## | 0099 | Implementing a Hybrid Network to perform Image Classification using Chest X-ray Images for COPD & Asthma

Manish Shukla<sup>1,#</sup>, Payal Nene<sup>2</sup>, Debshree Bhattacharya<sup>3</sup>, Shweta Pandey<sup>4</sup>,

V. Hemant Kumar<sup>5</sup>, Roopesh Kumar<sup>6</sup>

#### **ABSTRACT:**

Asthma and Chronic Obstructive Pulmonary Disease (COPD) are common respiratory diseases that impose high health burdens globally. Proper early diagnosis is essential for an effective treatment. Chest X-ray imaging, being extensively accessible and affordable, is still the first choice as a diagnostic aid. However, the process is mostly laborious and susceptible to error. In this paper, we have introduced a deep learning-based image classification approach that utilizes a hybrid network of DenseNet201 and EfficientNet-B3 models. We used publicly available datasets for our model. The proposed approach proved more effective than the existing state-of-the-art techniques in terms of accuracy (95.2%), sensitivity rate of 94.8%, and specificity rate of 95.7%. These findings show the potential of the proposed algorithm to support clinical decision-making and enhance early detection results for asthma and COPD.

Keywords: COPD, Asthma, Chest X-ray, Deep Learning, DenseNet201, EfficientNet-B3, Medical Imaging

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## | 0107 | Optimizing Boolean Equations: The Benefits of Quine-McCluskey Method over K-Map

Kirti Kale <sup>1</sup>, Ajay Khushwaha<sup>2</sup>, Vikas singh<sup>3</sup>, Bharat Peshwani<sup>4</sup> Deepak Pandey<sup>5</sup> Gaurav Sahu<sup>6</sup>

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#### **ABSTRACT:**

Boolean function minimization is a crucial step in digital circuit design, as it enables the reduction of complex logical expressions into simpler forms, thereby optimizing circuit performance and reducing costs. Two popular methods for Boolean minimization are the Quine-McCluskey (QM) method and the Karnaugh map (K-map) method. This study provides a comprehensive comparison of these two methods, highlighting the advantages of the Quine-McCluskey method over the K-map approach. The Quine-McCluskey method is a tabular method that uses a systematic approach to minimize Boolean functions. It works by combining adjacent min terms and eliminating redundant terms, resulting in a minimized expression. In contrast, the K-map method is a graphical approach that relies on visual inspection to identify patterns and minimize Boolean functions.

Our analysis reveals that the Quine-McCluskey method offers several advantages over the K-map method. Firstly, the QM method is more systematic and less prone to human error, as it relies on a tabular approach rather than visual inspection. Secondly, the QM method can handle larger Boolean functions with more variables, making it a more scalable solution. Finally, the QM method provides a more formalized approach to Boolean minimization, making it easier to implement and automate.

Keywords: Boolean function minimization, SOP, POS, Quine-McCluskey method, Karnaugh map (K-map) method

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## | 0110 | Design and Development of a 40 kV Electrostatic Precipitator Prototype for Air Pollution Control

Shruti Dey<sup>1</sup>, Aman Chourasiya<sup>2</sup>, Manish Bhuarya<sup>3</sup>, Neelkanth Sahu<sup>4</sup> Satyadharma Bharti<sup>5</sup>

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#### **ABSTRACT:**

This study presents the design and development of a 40 kV electrostatic precipitator prototype for efficient air pollution control, utilizing the principle of corona discharge for particulate matter removal. The system replicates the core functionality of industrial electrostatic precipitators through a compact design comprising a high-voltage DC generator (40 kV), metal mesh electrodes, a 3.7 V battery source, and a PVC pipe housing. Contaminated air passing through the unit is ionized, and the charged particles are subsequently collected on oppositely charged electrodes, effectively purifying the air. To enhance system intelligence and energy efficiency, the electrostatic precipitator is integrated with an embedded real-time monitoring and control mechanism using an Arduino Uno microcontroller. The setup includes an MQ-2 smoke sensor for continuous pollutant detection, a relay module to control high-voltage activation, a buzzer for audio alerts, and a 16x2 I2C LCD for displaying real-time system status. When smoke is detected, the system activates the electrostatic precipitator and the alarm, it automatically deactivates once air quality stabilizes.

Keywords: Air Pollution Control, Arduino Uno, Corona Discharge, Electrostatic Precipitator, Embedded System, Energy Efficiency

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## | 0141 | Boosting the Efficiency of Motor for Electrically Driven System

Suchita Roy<sup>1</sup>, Shruti Wasnik<sup>2</sup>, Neha Joshi<sup>3</sup>, Moh. Faizan Ahmed<sup>4</sup>, Soniya Sinha<sup>5</sup>

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#### **ABSTRACT:**

Due to the growing negative effects of global warming and the grave concerns surrounding the depletion of fossil resources, electric vehicles are becoming more and more popular nowadays in our culture. Electrical vehicles can now operate at their best under various load levels thanks to advancements in power electronic technologies.

The main theme of this research is the induction motor's difficulty in maximizing energy efficiency under light load conditions. By improving the system's efficiency and performance in both high and low load circumstances, it would facilitate the motor's smooth operation at optimal torque. By lowering copper and iron losses as well as the system's torque and speed control, the different loss reduction techniques expand the system's functionality. IM rotor flux optimization is essential for extending the range of an electric vehicle on a single charge. The objective is to reduce ohmic losses in field-oriented motors that operate in response to flux-producing current. This paper introduces a novel vector control technique in an effort to improve the efficiency of induction motors in electric driving applications. It would be ideal for this effort to design a loss reduction controller that can boost efficiency. For an induction motor drive with a loss factor, vector control techniques are used. The suggested technique based on a loss model minimizes the most important motor losses. A detailed analysis is also conducted of the drive's performance in dynamic situations.

Keywords: Electric Vehicle; Induction Motor; Loss Reduction Techniques; Vector Control Technique

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## | 0177 | ESP32 Module-Based IOT Monitoring of a Single-Phase Induction Motor

Shruti Wasnik<sup>1, #</sup>, Suchita Roy<sup>2</sup>, Moh. Faizan Ahmed<sup>3</sup>, Neha Joshi<sup>4</sup>, Soniya Sinha<sup>5</sup>, Asha Verma<sup>6</sup>

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#### **ABSTRACT:**

This paper's primary goal is to use IOT to monitor a single-phase induction motor. Motor condition monitoring is crucial and every electrical unit has a maintenance program in place. Motor parameters including temperature, current, voltage, and vibration can be wirelessly accessed in the proposed work using Internet of Things technology. The operator may analyze all of these parameters from any location and an alert can be raised in the event of a fault condition. When combined with machine learning, IOT-based condition monitoring can aid in fault classification and prediction. Any industry uses electrical motors as a workhorse. Electrical motors require routine maintenance and observation. Such revolving machinery malfunctions or breakdowns can have a number of negative effects on the sector.

Automation of electrical power generation or alternative power sources are required to support the utility supply in emerging nations due to power instability. This automation is necessary since the frequency of power outages is increasing. The suggested motor monitoring technique can be used to monitor motor parameters in real time and to send out regular notifications in the event that a parameter deviates from its typical value.

Keywords: Single-phase Induction Motor; IOT; ESP32 MOUDLE; Wireless; Motor Parameter

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## | 0270 | Transmission Line Fault Detection with Temperature Protection

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#### **ABSTRACT:**

This system aims to detect faults in transmission lines and prevent damage from overheating. It utilizes sensors to monitor temperature and current fluctuations, enabling swift identification of faults like short circuits or overloads. Upon detecting anomalies, the system triggers protective measures, such as circuit breakers, to isolate the faulty section and prevent cascading failures. By integrating temperature monitoring, it enhances reliability and reduces downtime in power transmission systems. The system uses advanced components like relay modules, thermistor temperature sensors, and transformers to detect and isolate faults, ensuring stability and reliability of the power supply. The relay module switches the power supply to the thermistor sensor, which detects temperature increases caused by faults, while the transformer steps down voltage for safe operation. The system offers accurate fault detection, a compact and reliable design, and ease of integration into existing power systems.

Keywords: Transmission line, anomalies, fluctuation, monitoring

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## | 0318 | Assessing Grid Stability Under High Solar Photovoltaic Penetration: Challenges and Mitigation Strategies

T M Swathy<sup>1, #</sup>, Lakhwinder Kaur<sup>2</sup>, B Laxman Rao<sup>3</sup>, Megha Kataria<sup>4</sup>, Roshan Dutt Kashyap<sup>5</sup>, Chandra Shekhar Nagendra<sup>6</sup>

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#### **ABSTRACT:**

The increasing penetration of solar photovoltaic (PV) systems in modern power grids presents both opportunities and challenges. While solar PV contributes to decarbonization and distributed generation, its inherent intermittency, non-synchronous nature, and variability pose significant concerns for grid stability. This study provides a comprehensive assessment of the technical challenges associated with high PV integration, with particular focus on frequency stability, voltage regulation, system inertia reduction, and protection scheme coordination. A case study is conducted using a modified IEEE 14-bus system subjected to varying levels of PV penetration, simulating dynamic responses to disturbances. The analysis incorporates advanced inverter models, including grid-following and grid-forming controls, as well as the integration of battery energy storage systems (BESS) to mitigate instability. Simulation results demonstrate that while high PV penetration can adversely impact dynamic performance, targeted mitigation strategies—such as synthetic inertia emulation, volt/VAR control, and coordinated control of distributed energy resources—significantly enhance grid resilience. The findings underscore the need for adaptive planning, control, and regulatory frameworks to support the secure integration of large-scale solar PV into existing power networks.

Keywords: Solar Photovoltaic Integration; Grid Stability; Frequency Response; Voltage Regulation; Inverter-Based Resources; Synthetic Inertia

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### | 0352 | Autonomous Fire Extinguisher Robotic Car

Debshree Bhattacharya<sup>1,#</sup>, Akshit Pandey<sup>2</sup>, Abhishek Kumar<sup>3</sup>, Sudha Rani Ekka<sup>4</sup>,

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#### **ABSTRACT:**

Fire Hazard Pose a significant threat to human life and property, often requiring rapid response and invention. Traditional firefighting methods involve human risk and time delays, which can lead to severe damage. This Project presents an Autonomous Fire Extinguisher Robotic Car, designed to detect and extinguish fire without human intervention. The robotic car is equipped with advanced sensors, including flame and temperature sensors, to identify fire sources accurately, It uses AI based decision making and autonomous navigation to reach the fire affected area efficiently. A fire suppression system, integrated with water or chemical extinguishers, ensures quick and effective firefighting. This innovation enhances safety, minimises response time, and reduces property loss, making it suitable for industrial zones, warehouses, and residential buildings. With its autonomous capabilities, this robotic car provides reliable, cost effective and scalable solutions for modern fire emergencies.

Keywords: Battery Driver, Microcontroller, Motor, Relay, Temperature Sensor, Water Pump.

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## | 0353 | Key-frame Extraction of Wildlife Video based on Semantic Context Modeling

Lakhwinder Kaur<sup>1, #</sup>, T M Swathy<sup>2</sup>, Megha Kataria<sup>3</sup>, B. Laxshaman Rao<sup>4</sup>, C S Nagendra<sup>5</sup>, Roshan Datt Kashyap <sup>6</sup>

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#### **ABSTRACT:**

In recent work on image and video retrieval there seems to be a shift of focus from low-level feature extraction to producing high-level semantic representation of scenes. This paper presents a framework that produces semantic context features from video frames which are then employed for keyframe extraction. Working with wildlife video frames, the framework starts with image segmentation, followed by low-level feature extraction and classification of the image blocks extracted from image segments. Based on the image block labels in the neighbourhood a co-occurrence matrix is then constructed to represent the semantic context of the scene. The semantic co-occurrence matrices then undergo binarization and principal component analysis for dimension reduction, forming the feature vectors used in a one-class classifier that extracts the key-frames. Experiments show that the utilization of high-level semantic features result in better key-frame extraction when compared with methods using low-level features only.

Keywords: Image semantic analysis, classification, video summarization

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## | 0388 | IoT-Enabled Adaptive Buck and Boost Converter for Dynamic Voltage Regulation in Solar-Powered Systems

Arpit Banerjee<sup>1</sup>, Albert John Varghese<sup>2\*</sup>, Rejo Roy<sup>2</sup>, Saumya Singh Chauhan<sup>1</sup>, Ayush Kumar Verma<sup>1</sup>

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#### **ABSTRACT:**

The demand for efficiency, accuracy, and cost-effectiveness in industries has led to the widespread adoption of automation technologies. The bottling and capping process is a critical aspect of various industries such as food and beverage, pharmaceuticals, and cosmetics. This study explores the implementation of an automated bottling and capping system using the Arduino microcontroller. The proposed system incorporates sensors (e.g., Infrared, Ultrasonic) and actuators (e.g., Relay module) in order to mitigate the risk of errors and enhance overall operational efficiency, ensuring a consistent bottling and capping process. The study covers the implementation of the automated system and includes performance evaluations of the processes involved. Real-time monitoring capabilities are integrated into the system, providing alerts in case of any issues during production, thus guaranteeing a consistent level of product quality. This study underscores the significant role that Arduino-based systems can play in industrial automation by enhancing precision and reducing manual intervention. The results validate the feasibility and advantages of the Arduino driven system and showcases its capacity to revolutionize manufacturing practices while ensuring optimal efficiency and precision.

Keywords: Adaptive DC-DC Converter, Buck-Boost Regulation, ESP32, Solar Energy, IoT Monitoring, PWM Control, Smart Power Management

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## | 0390 | Implementation of an IoT-Based Smart Energy Monitoring and Load Control System Using ESP32 and PZEM-004T

Asad Jalal<sup>1</sup>, Rejo Roy <sup>2\*</sup>, Albert John Varghese<sup>2</sup>, Tushar Kumar<sup>1</sup>, Ishant Sahu<sup>1</sup>, Binit Kumar<sup>1</sup>

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#### **ABSTRACT:**

With the growing demand for electrical energy, remote monitoring and control of loads has become essential for efficient energy management. This paper presents the design and implementation of a smart, cost-effective energy monitoring and control system based on the Internet of Things (IoT). The system employs the ESP32 microcontroller in conjunction with the PZEM-004T energy metering module to measure vital electrical parameters such as voltage, current, active power, energy consumption, and frequency in real time. The measured data is displayed locally using a 20x4 I2C LCD and wirelessly transmitted to the Blynk mobile application via Wi-Fi, allowing for remote access and analytics. A relay module is incorporated to facilitate remote switching of electrical loads, enabling effective demand-side management. Developed using the Arduino IDE and open-source libraries, the system ensures ease of development, scalability, and adaptability. Its application is well-suited for smart homes, educational environments, and small-scale industrial systems. The integration of real-time monitoring with remote control highlights the potential of IoT-based solutions for intelligent and sustainable energy usage.

Keywords: IoT, ESP32, PZEM-004T, Smart Energy Monitoring, Remote Load Control, Real-Time Data, Blynk App, Embedded Systems, Arduino IDE, Home Automation

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### | 0392 | Advancements in Power Converter Topologies and Battery Management Strategies for High-Efficiency Electric Vehicles

Rejo Roy<sup>1</sup> and Albert John Varghese<sup>1\*</sup>

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#### **ABSTRACT:**

The global shift toward sustainable transportation necessitates significant improvements in electric vehicle (EV) technologies, particularly in power conversion and battery management. This paper presents a comprehensive review of recent innovations in power converter topologies—such as Boost, Cuk, SEPIC, and multiport designs—that have demonstrated enhanced charging efficiency, increased power density, and reduced electromagnetic interference (EMI). The role of bidirectional converters in enabling efficient vehicle-to-grid (V2G) energy exchange is examined, emphasizing their contribution to smarter and more resilient power networks. Advanced control strategies, including magnetically coupled converters, optimize voltage regulation and power routing to further elevate system performance. Concurrently, advancements in battery management systems (BMS) are critical for ensuring safety, extending battery life, and maintaining optimal performance under dynamic conditions. The integration of intelligent charging algorithms supports fast-charging requirements while preserving battery health, and the incorporation of renewable energy sources into EV charging infrastructure promotes environmental sustainability. Despite these advances, challenges such as high implementation costs, infrastructure integration, and system complexity continue to impede large-scale deployment. This paper evaluates current technological trends, discusses their practical impacts, and outlines future research directions essential for the development of high-efficiency, sustainable EV systems.

Keywords: Electric Vehicles, Power Converter Topologies, Battery Management Systems, Vehicle-to-Grid (V2G), Bidirectional Converters, Fast Charging, Renewable Energy Integration, Electromagnetic Interference (EMI), Sustainable Transportation, Energy Efficiency

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## | 0399 | Reliability and Economic Viability of Renewable Energy Systems using Artificial Intelligence: Review & Future Aspects

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#### **ABSTRACT:**

The worldwide pivot toward sustainable energy sources has spurred an increase in the incorporation of renewable energy systems (RES) into preexisting power networks. The simultaneous implementation of AI techniques has shown promise to enhance these systems' efficiency, dependability, and business feasibility. In this study, we survey the present landscape of research on renewable energy and artificial intelligence, summing up important techniques, obstacles, and successes along the way. Optimizing many aspects of RES, such as resource assessment, energy forecasting, system monitoring, control techniques, and grid integration, encompasses a wide range of AI applications. We investigate optimization methods, neural networks, and machine learning algorithms to see how they can help manage complex data, enhance forecasting abilities, and improve renewable energy systems that can change quickly.

Keywords: RES, energy forecasting, data variability, real-time adaptability, machine learning algorithms, etc

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## | 0446 | Design and Analysis of a Geometry-Driven Tunable THz Absorber for Refractive Index Sensing

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#### **ABSTRACT:**

The proposed work presents a comprehensive numerical study of a geometrically tunable terahertz (THz) metamaterial absorber for refractive index sensing applications. The absorber's response is evaluated under simultaneous variation of both the surrounding dielectric environment represented by Refractive Index ranging from n = 1.2 to 1.8 and its structural geometry. Its influence on the absorber's resonant behaviour is systematically analysed. Resonance characteristics, including resonant frequency, quality factor (Q), sensitivity, and figure of merit (FOM), are extracted for both lower and higher-order modes exhibiting absorption greater than 0.9. Results demonstrate that increasing the refractive index, leads to a pronounced red-shift in the resonant frequency, accompanied by improvements in Q and FOM. For lower resonant modes, a maximum sensitivity of 21.99 THz/RIU and FOM of 61.47 are achieved, while higher-order modes yield a sensitivity of 3.08 THz/RIU and FOM of 5.34., underscoring the potential of the proposed absorber for high-resolution, reconfigurable THz sensing applications.

Keywords: THz Absorber; Geometrical Tunability; Refractive index sensing; Sensitivity; Figure of merit (FOM); Quality factor (Q-factor)

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### | 0473 | Ev Bms With Charge Monitor and Fire Protection

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#### **ABSTRACT:**

Globally in vehicle segment Electric Vehicle are drastically upgrading and people migrating from diesel/petrol vehicles to electric vehicles. When electric vehicle comes in the discussion then important parameter is Battery pack of EV. A proposed Battery Management System (BMS) tailored for electric vehicles is introduced. This system oversees the operation of a rechargeable battery, whether it be a single cell or a battery pack. Its functions include safeguarding the battery against operating beyond its safe operational parameters and monitoring its condition. Electric vehicles (EVs) are rapidly gaining popularity as a sustainable alternative to fossil fuel-based transportation. The Battery Management System (BMS) is a critical component that ensures the safety, efficiency, and longevity of EV batteries. This paper presents a BMS model integrated with a real-time charge monitoring system and an advanced fire protection mechanism. The system ensures accurate state-of-charge (SOC) detection, temperature control, overcharge/discharge protection, and emergency shutdown in case of fire hazards. The proposed system enhances safety and operational reliability in EVs.

Keywords: EV, Battery Management System, Charge Monitoring, fast and slow charging protection, cooling mechanism, Fire Protection, Lithium-ion Battery, SOC

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AI-Driven Innovations in Engineering, Health Sciences, and Sustainability

TRACK 4 - INTERNATIONAL
CONFERENCE ON INNOVATIVE
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ENVIRONMENTAL, AND
AGRICULTURAL DEVELOPMENT



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## |0010|A Review on Design and Characterization of Photocatalyc concrete for environmental sustainability

Praveen Mahapatra<sup>1, #</sup>, Meghal Dewangan<sup>2</sup>, Nand Kumar Sahu<sup>3</sup>, Keshi Janghel<sup>4</sup>, Keshi Janghel<sup>5</sup>, V. Suhasini<sup>6</sup>

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#### **ABSTRACT:**

The day to day increase in Air pollution and environmental degradation has became an important factor in today's lifestyle. Advance researches have suggested many ideas to overcome this problem. many advanced construction materials have already been introduced to overcome the problems of construction industry. This research clearly focuses on design and development of an improved mix of photocatalyc concrete. The main function of this type of concrete is to do effective air purification. It also results in environmental sustainability. Titanium di oxide is used as photocatalyst will be mixed in concrete will results in reducing harmful air pollutants such as NOx, Sox etc. To improve the eco friendly nature, in this mix, some natural admixtures, like GGBS and very little percentage of fly ash and cow dung ash(CDA) also to be added as partial substitute of cement might results in reducing the carbon footprint with traditional concrete production. Comprehensive tests for example on green concrete, workability tests to be done, and for hardened destructive tests like compression test to be done accordingly to finalize the suitability of concrete in various building structures . The study aims to the development of sustainable construction materials that will lead to achieve green construction and sustainable environment.

Keywords: Advanced Construction materials, Photocatalyc Concrete, Air Purification in Concrete, GGBS, Cow Dung Ash (CDA), Green Construction.

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## |0012|"Helix Micro Fibers Concrete for Resilient Infrastructure Solution & Engineering Sustainability"

V Suhasini<sup>1, #</sup>, Kritika Thakur<sup>2</sup>, Keshi Janghel<sup>3</sup>, Meghal Dewangan<sup>4</sup>, Praveen Mahapatra<sup>5</sup>, Nand Sahu<sup>6</sup>

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#### **ABSTRACT:**

This is an experimental study focused on studying the effect of adding helix fiber to normal concrete to evaluate compressive strength, tensile strength, stability, elastic modulus, and to improve the desired consistency of the mixture required for workable concrete compared to normal concrete. As concrete is strong in compression and week in tension, steel is placed in concrete where ever tension is anticipated. The process is proven to be cumbersome, time consuming and expensive Steel Helix fiber with more frictional resistance are added in concrete matrix to improve tensile strength of concrete. Grade M 20 concrete mixture was used and the mix ratio was determined. Stress-strain curves were recorded for different dosages of helix fiber after 28 days to determine the elastic modulus. The results showed that the addition of spiral fiber to normal concrete increases the compressive strength, tensile strength, elastic modulus, and ductility of the concrete compared to normal concrete. The results of this study suggest that the use of helical fibers instead of normal rebars increases the strength of concrete and fly ash is added to concrete to maintain the workability of concrete. This improves the strength parameters and workability of concrete as per the desired requirements.

Keywords: Structural Engineering", "Fiber-Reinforced Concrete", "FRC Composite", "Concrete Strength", "Concrete Cracks".

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## | 0075 | Organic Farming

Raja Kumar<sup>1, #</sup>, Dr. Shaziya Islam, Ambika Segnar, Jay Kumar Sharma, Rahul Kumar Singh, Aman Raj

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#### **ABSTRACT:**

Organic farming offers numerous benefits, including enhanced environmental sustainability, improved soil health, and better health for consumers and farmers. It reduces the reliance on synthetic chemicals, promotes biodiversity, and can contribute to a more resilient and sustainable food system. Organic farming minimizes the use of synthetic pesticides and fertilizers, reducing soil and water pollution. Practices like crop rotation, composting, and cover cropping enhance soil fertility, structure, and water-holding capacity. Organic farms tend to support higher levels of biodiversity due to the avoidance of synthetic chemicals and the use of diverse crop species. Organic farming can reduce greenhouse gas emissions and sequester carbon in the soil. It minimizes the use of synthetic pesticides and fertilizers, reducing pollution of soil, water, and air. Organic practices like composting and crop rotation help improve soil structure, water-holding capacity, and nutrient content. Organic farming methods can improve soil's water retention, reducing the need for irrigation. It encourages a wider variety of plant and animal species, contributing to a more resilient ecosystem. Organic farming promotes long-term sustainability by protecting soil health and natural resources. The growing demand for organic products can create new markets and income opportunities for farmers. Excessive use of synthetic fertilizers can deplete soil nutrients, damage the soil structure, and reduce the ability of crops to absorb essential nutrients.

Keywords: Organic farming, Soil health, Biodiversity, Composting, Crop rotation, Sustainability, Pesticide reduction, Water conservation, Carbon sequestration, Ecosystem resilience

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## | 0108 | Investigation on the Application of PEG-400 as an Internal Curing Agent in M30 Grade Concrete

Abhijeet Yadav<sup>1, #</sup>, Pooja Singh<sup>1</sup>, Kaminee Rathore<sup>1</sup>, Pooja Sikdar<sup>1</sup>, Prashant Tamarkar<sup>2</sup>, Asha Verma<sup>3</sup>

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#### **ABSTRACT:**

Envisioning a world without concrete is unimaginable. It's the very foundation and lifeblood of our infrastructure. Its well-known features include high compressive, tensile, and flexural strength. To avoid water constraints, we offer self-curing concrete as an alternative to immersion internal curing, also known as self-curing, is a critical step in the production of concrete's pore structure and microstructure. Curing increases the durability of concrete. The goal of this research is to examine the impacts of adding 0.0% 0.5%, 1%, and 1.5% polyethylene glycol-400 by weight of cement as an additive to an M-30 grade concrete mix for internal curing. This work also investigated the effect of polyethylene glycol on the compressive, tensile and flexural strength of concrete by altering the proportion of polyethylene glycol-400 to discover the optimum percentage for self-curing agent. It is the procedure we employ when outside curing is not a possibility, such as in areas with limited water supply or restricted human access. Water curing is essential for preventing cement concrete's undesirable characteristics. To ensure high-quality curing, excess evaporation from the surface must be avoided. It has been seen that self-curing PEG-400 concrete at 7 and 28 days, respectively, self-curing PEG-400 demonstrated an avg. improvement in compressive strength of 7.735% and 13.332% over traditional curing. According to the experimental work, PEG-400 gives the mix-30 a compressive, tensile, and flexural strength of 1% is the optimum dosage.

Keywords: self-curing concrete; ordinary concrete; mechanical properties; relative humidity test; self-curing agent PEG-400; workability.

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### | 0113 | Study on Structural Evaluation of Flexible Pavement Using Non-destructive Techniques

Pooja Sikdar<sup>1, #</sup>, Pooja Singh<sup>2</sup>, Abhijeet Yadav<sup>3</sup>, Kaminee Rathore<sup>4</sup>, Priyanka Singh<sup>5</sup>

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### **ABSTRACT:**

Flexible pavements form the backbone of roadway infrastructure, and their long-term performance depends on timely evaluation and maintenance. This study focuses on the structural evaluation of flexible pavements using non-destructive techniques (NDT), with an emphasis on assessing in-situ pavement conditions without causing damage to the existing structure. Non-destructive methods such as the Falling Weight Deflectometer (FWD), Ground Penetrating Radar (GPR), and Light Weight Deflectometer (LWD) were employed to evaluate pavement deflections, layer thicknesses, and subgrade response. Field data were collected from selected low and medium-volume roads to analyze structural adequacy and detect early signs of distress. The results demonstrated that NDT techniques are effective in identifying weak zones, estimating layer moduli, and predicting remaining service life. This approach provides a reliable, time-efficient, and cost-effective alternative to traditional destructive methods. The findings support the integration of NDT in pavement management systems to enable proactive maintenance planning and extend pavement life, especially in resource-constrained and rural areas.

Keywords: Flexible pavements, non-destructive techniques, pavement deflections, structural evaluation

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### | 0120 | AI for Disaster Prediction: A Machine Learning Framework using Multimodal Data Focused on the Indian Region

Irshad Alam<sup>1, #</sup>, Dr. Shaziya Islam, Pradeep kumar, Mandeep Kumar, Kumar Prakhar, Mimshad Alam,

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### **ABSTRACT:**

India's vulnerability to diverse natural and human-made disasters demands the development of accurate and timely prediction systems. This paper proposes a machine learning framework that integrates multimodal data, including geo-tagged social media posts and structured environmental datasets from Kaggle. The proposed system leverages XGBoost for classification, and our evaluation demonstrates a significant performance boost over baseline models. We also present comparative results with a deep learning-based LSTM model. This framework, which is adaptable and publicly replicable, provides a promising solution for early disaster alerts in the Indian context.

Keywords: Disaster Prediction, Machine Learning, Multimodal Data Integration, XGBoost, LSTM, Social Media Analytics, Environmental Datasets, Early Warning Systems, India, Disaster Management

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### |0124|Comparative Study of Carbon Footprint and Strength Characteristics of Conventional and Sustainable Concrete Mix Designs

Nand Kumar Sahu<sup>1</sup>, Praveen Mahapatra<sup>2</sup>, Meghal Dewangan<sup>3</sup>, Keshi Janghel<sup>4</sup>, Kritika Thakur<sup>5</sup>, V. Suhasini<sup>6</sup>

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### **ABSTRACT:**

The construction industry is a major contributor to global carbon emissions, primarily due to the extensive use of ordinary Portland cement (OPC) in concrete production. This study presents a comparative evaluation of the environmental and mechanical performance of conventional concrete and a sustainable alternative incorporating supplementary cementitious materials (SCMs), specifically fly ash and ground granulated blast furnace slag (GGBS). Two concrete mixes were prepared: a control mix with 100% OPC and a sustainable mix with partial replacement of cement by SCMs. Compressive strength tests were conducted at 7 and 28 days to assess the structural performance of both mixes. Simultaneously, a life cycle assessment (LCA) approach was adopted to quantify the carbon footprint of each mix, considering all stages from raw material extraction and processing to transportation and energy usage. The results indicate that the sustainable concrete mix achieves comparable compressive strength to that of the conventional mix while significantly reducing carbon dioxide (CO<sub>2</sub>) emissions. The study highlights the potential of SCM-based green concrete as an effective strategy for reducing the environmental impact of construction without compromising structural integrity. These findings support the wider adoption of sustainable concrete practices in the construction industry, aligning with global goals for carbon reduction and sustainable development.

Keywords: Sustainable concrete; Supplementary cementitious materials (SCMs); Fly ash; GGBS; Ordinary Portland cement (OPC); Compressive strength; Life cycle assessment (LCA); Carbon footprint; Green construction; Environmental impact.

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### |153| A Review on Early-Stage Compressive Strength Prediction of Concrete Using AI and Machine Learning Techniques

Kritika Thakur<sup>1, #</sup>, V Suhasini<sup>2</sup>, Keshi Janghel<sup>3</sup>, Meghal Dewangan<sup>4</sup>, Praveen Mahapatra<sup>5</sup>, Nand Sahu<sup>6</sup>

1,2,3,4,5,6 Assistant professor, Department of Civil Engineering, RCET Bhilai Chhattisgarh, India

#### **ABSTRACT:**

The accurate prediction of early-stage compressive strength of concrete is critical for optimizing construction schedules, ensuring structural safety, and reducing material costs. Traditional methods for strength estimation are time-consuming and often require destructive testing, which limits their applicability for real-time decision-making. This research explores the use of Artificial Intelligence (AI) and Machine Learning (ML) techniques to develop predictive models for estimating the early compressive strength of concrete based on mix design parameters and curing conditions. Various supervised ML algorithms, including Linear Regression, Decision Trees, Support Vector Machines (SVM), Random Forest, and Artificial Neural Networks (ANN), were trained and evaluated using a comprehensive dataset of concrete mix compositions. The models were assessed based on accuracy, mean absolute error, and root mean square error to determine their predictive performance. The results demonstrate that AI/ML models can effectively capture the complex nonlinear relationships between input features and compressive strength, offering a reliable, non-destructive alternative to traditional testing. This study highlights the potential of intelligent data-driven approaches to enhance quality control and decision-making in modern construction practices.

Keywords: Concrete Compressive Strength, Early Strength Prediction, Artificial Intelligence, Machine Learning, Non-Destructive Testing, Mix Design

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### |0182| Comparative Study of Corrosion and Mechanical Properties of Conventional MMCs, Nano-Enhanced MMCs, and Polymer Matrix Composites in Coastal Structures

Keshi Janghel<sup>1</sup>, Meghal Dewangan<sup>2</sup>, Nand Kumar Sahu<sup>3</sup>, Praveen Mahapatra<sup>4</sup>, V.Suhasini<sup>5</sup>, Kritika Thakur<sup>6</sup>

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#### **ABSTRACT:**

Coastal and offshore constructions are frequently subjected to harsh marine conditions with high salinity, high humidity, and varying mechanical strains, which causes traditional building materials to gradually deteriorate. A comparative analysis of the mechanical characteristics and corrosion resistance of conventional metal matrix composites (MMCs), nano-enhanced MMCs (Nano-MMCs), and polymer matrix composites (PMCs) for possible use in coastal structural applications is presented in this study in order to address these issues. Using hand lay-up techniques and improved stir casting, glass fiber reinforced polymer (GFRP) composites, nano-MMCs that combine nano-sized silicon carbide and alumina (AlO<sub>3</sub>), and aluminum 6061-based MMCs reinforced with micron-sized silicon carbide (SiC) were created. Aluminum 6061-based MMCs reinforced with micron-sized silicon carbide (SiC), Nano-MMCs containing nano-sized SiC and alumina (Al<sub>2</sub>O<sub>3</sub>) nanoparticles, and Glass Fiber Reinforced Polymer (GFRP) composites were fabricated and subjected to mechanical characterization, including tensile, flexural, and fatigue testing. Corrosion resistance was assessed through salt spray tests and immersion in 3.5% NaCl solution to simulate marine conditions. The results indicated that Nano-MMCs exhibited notable improvements in tensile strength, flexural capacity, fatigue life, and corrosion resistance when compared to conventional MMCs. PMCs demonstrated superior corrosion immunity but lower mechanical strength under cyclic loads. Additionally, a life-cycle cost analysis suggested that Nano-MMCs, while having higher initial costs, provided superior durability and reduced long-term maintenance expenses. This study establishes Nano-Enhanced MMCs as a high-performance, sustainable material option for future marine and offshore infrastructure.

Keywords: Metal Matrix Composites (MMCs), Nano-Enhanced Metal Matrix Composites (Nano-MMCs), Polymer Matrix Composites (PMCs), Corrosion Resistance, Mechanical Properties, Coastal Structures,

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# |0194| OPTIMIZATION OF URBAN DRAINAGE SYSTEMS USING SUSTAINABLE DETENTION BASINS AND DEVELOPMENT OF A WATER SUPPLY SCHEME

Pooja singh<sup>1#</sup>, pooja sikdar<sup>2</sup>, Kaminee rathore<sup>3</sup> Abhijeet Yadav<sup>4</sup>, Prashant tamrakar<sup>5</sup>, priyanka singh<sup>6</sup>

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### **ABSTRACT:**

Rapid urbanization has led to increased surface runoff and frequent urban flooding, posing significant challenges to stormwater management. Traditional drainage systems often prove inadequate in managing peak flows, leading to waterlogging, infrastructure damage, and environmental degradation. This study focuses on optimizing urban drainage systems through integrating sustainable retention and detention basins. The research aims to evaluate the effectiveness of these nature-based solutions in mitigating urban runoff, enhancing groundwater recharge, and improving overall drainage efficiency. A comprehensive methodology was adopted, including site selection based on topographical and hydrological analysis, catchment area delineation, and suitability assessment using GIS tools. Design parameters for both retention and detention basins were developed considering rainfall intensity, runoff volume, and land availability. The proposed model was applied to a case study area along Bypass Road in Durg, Chhattisgarh, where significant drainage issues were observed. The results demonstrate that incorporating strategically placed basins can significantly reduce peak runoff rates and delay flow, thereby improving the resilience of urban infrastructure to extreme rainfall events. Additionally, the study underscores the importance of integrating green infrastructure with conventional systems to promote sustainable urban development. The findings provide practical recommendations for urban planners and engineers seeking to implement ecofriendly and cost-effective drainage solutions.

Keywords: Urbanization, Surface, runoff, Drainage systems, Retention basins

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### |0202|Comparative Analysis of the Strength of Concrete Made from Various Aggregates

Abhinav saraf<sup>1, #</sup>, Anurag yadav<sup>2</sup>, Ayush Dubey<sup>3</sup>, Abhinash Kumar<sup>4</sup>, Pooja singh<sup>5</sup>

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#### **ABSTRACT**

This particular study aims to investigate the compressive strength of concrete that was prepared using different coarse and fine aggregates. This is to determine how the type of aggregate affects the mechanical properties of concrete, and its compressive strength as a major performance parameter. All types of aggregates, including crushed granite, gravel, basalt, limestone, and recycled concrete, were collected to prepare concrete mixes under Controlled Conditions. The mixes were tested at 7-, 14, and 28-day curing periods to monitor strength development over time. Experimental results showed there were notable differences in compressive strength due to the aggregates' physical and mechanical properties, for example: shape, texture, density, and water absorption. The highest strength values were achieved from concrete made with crushed granite and basalt, whereas the least performing mixes contained recycled aggregates and gravel. This study demonstrates that the type of aggregate used might influence the strength of concrete, and such aggregates should be chosen thoughtfully when integrated in construction designs, be it structural or civil engineering, to enhance performance and ensure longevity.

Keywords: compressive strength, curing, water absorption, aggregate, concrete.

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## |0205|Prefabricated concrete sandwich and other lightweight wall panels for sustainable building construction:

Amit kumar<sup>1</sup>, Saswat Mishra<sup>2</sup>, Rishabh Shukla<sup>3</sup>, Satyam kumar Mishra<sup>3</sup>, Pranay praveen<sup>5</sup>, Pooja singh<sup>6</sup>

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### **ABSTRACT:**

The current focus is on developing energy-efficient and sustainable buildings to reduce carbon emissions. To achieve this, prefab external wall panels that form the building envelope play a crucial role, as they maintain the indoor environment and thermal comfort and control the heating and cooling energy consumption, as well as the safety of the occupants of the buildings. Thus, the energy-efficient off-site fabricated building envelope significantly contributes to achieving net-zero targets in the construction sector set by the governments. An ideal prefabricated wall panel should be lightweight, eco-friendly, durable, fire-resistant, and easily installable. In addition, it should possess high strength, thermal resistance, and acoustic insulation. This study aims to review the most widely used external prefabricated wall panels in the building construction industry. Five types of prefab wall panels, namely, lightweight timber framed (LTF) panels, light-gauge steel-framed (LSF) panels, structural insulated panels (SIP), cross-laminated timber (CLT) panels, and precast concrete sandwich panels (PCSP), which are commonly used for prefabricated building facades, are reviewed with regard to their function, structural, thermal, and fire performances, with an in-depth focus on the PCSPs.

Keywords: prefab building, prefabricated wall panel, building envelope, precast sandwich concrete panel, sustainable

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### |0222|The Effect of Admixtures on Concrete Properties

Mihir Yadav<sup>1, #</sup>, Kundan Sahu<sup>2</sup>, Keshi Janghel<sup>3</sup>, Dhalkeshar Sahu<sup>4</sup>, Nand Kumar Sahu<sup>5</sup>, Meghal Dewangan<sup>6</sup>

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### **Abstract:**

This study investigates the effectiveness of superplasticizer admixtures in enhancing the performance of concrete under hot weather conditions in Sudan for three grades: 15, 25, and 40 N/mm². The research aimed to improve workability, increase compressive strength, and reduce cement content for cost efficiency. Experimental work was conducted in two phases: testing of basic materials and a concrete testing program involving four mix variations per grade, including reference and admixture-enhanced mixes. Results showed significant improvements in workability, with slump values increasing up to 200 mm, and compressive strength gains of up to 55% at 28 days. Additionally, cement content was reduced by 23% without compromising strength or workability, demonstrating the admixtures' effectiveness in optimizing concrete performance in hot climates disease.

Keywords: Superplasticizer admixtures, concrete performance, hot weather, workability, compressive strength, cement reduction, cost efficiency, Sudan, concrete grades, slump.

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### |0229| A Review of the Effect of Copper Slag on the Concrete Properties

Yogita Chakravaishya<sup>1, #</sup>, Pooja Singh<sup>2</sup>, Dr. Jayant Damodar Supe<sup>3</sup>

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### **Abstract:**

The production of concrete has been responsible for 5% of global carbon emissions in recent decades. Simultaneously, the quantity of industrial waste is rising annually. Researchers have been quite interested in copper slag (CS), a harmless, non-toxic industrial waste, as a form of building material in recent years. In an effort to improve the unique properties of concrete, a great deal of research has been done to explore the potential mechanical and mineralogical properties of glass. Glass has been used in concrete in a variety of forms, including powder, fine and coarse aggregate, as part of aggregate, or in place of cement. This paper primarily reviews pertinent literature that has been published in the last ten years, performs a worldwide study to determine future research objectives for copper slag concrete and critically evaluates the performance of copper slag and the effect of partial replacement on performance. This study has consulted research to ensure that the result is thorough and trustworthy. The new performance, mechanical properties, and durability of copper slag concrete are analyzed in connection to three of its features: particle size, replacement rate, and replacement technique. In conclusion, when copper slag is substituted for some of the cement or aggregate in concrete, it may successfully improve the concrete's strength, resistance to sulphate corrosion, resistance to chloride ion corrosion, resistance to carbonation, and resistance to freezing and thawing. According to research on the durability and compressive strength of copper slag concrete, the replacement ratio and particle size of copper slag in concrete preparation should be less than 40% and less than 10 mm, respectively. Despite the need for improvement in the production process, the environmental impact analysis suggests that using copper slag as a partial alternative might mitigate the environmental impact. The durability and long-term mechanical properties of copper slag concrete need to be investigated further, according to a worldwide analysis of the data.

Key Words: Copper Slag, Fine Aggregate Replacement, Concrete Strength, Carbon Emission, Durability, Concrete Properties, Cement-based Material.

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## |0375| Women empowerment in Agriculture in Gunderdehi (Dist.-Balod)

Chesta Deshmukh <sup>1 #</sup>, Vivek Dewangan<sup>2,</sup> A.V.K. Santhoshi<sup>1</sup>, Renuka Verma<sup>1</sup>, Prabha Rani Sikdar<sup>3</sup>, Farhat Anjum<sup>4</sup>

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#### **ABSTRACT:**

Women play a pivotal role in Indian agriculture, yet their contributions often remain underrecognized and undervalued, particularly in rural and tribal regions. This study explores the current status, challenges, and opportunities for women empowerment in agriculture in Gunderdehi block, located in the Balod district of Chhattisgarh. Based on field observations, stakeholder interviews, and analysis of government schemes, the paper highlights the active involvement of women in crop cultivation, livestock management, and allied activities. Despite their significant role, women farmers in Gunderdehi face limited access to land ownership, agricultural credit, training, and decision-making platforms. The research also identifies successful models of self-help groups (SHGs), agribased microenterprises, and the impact of state-led initiatives like the Mahila Kisan Sashaktikaran Pariyojana (MKSP) in enhancing skill development, income generation, and social status of rural women. The paper emphasizes the need for gender-sensitive agricultural policies, access to modern technologies, and inclusive extension services. Empowering women in agriculture is not just a matter of social justice but also a strategic approach for improving food security, rural livelihoods, and sustainable development in regions like Gunderdehi.

Keywords: Women in agriculture, empowerment, Gunderdehi, Chhattisgarh, SHGs, rural development, gender equity.

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## |408|A Case Study of The Ocean Cleanup: Harnessing AI-Driven Robotics for Ocean Conservation

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#### **ABSTRACT:**

The Ocean Cleanup initiative has pioneered the integration of artificial intelligence (AI) and robotics to address the escalating crisis of ocean plastic pollution. This case study examines the deployment of AI-driven technologies, specifically the Autonomous Debris Imaging System (ADIS), developed in collaboration with Au-Zone Technologies. ADIS utilizes edge AI and 3D spatial perception to autonomously detect and classify plastic debris in real-time, significantly enhancing data collection capabilities. By equipping merchant and cruise vessels with AI-powered cameras, The Ocean Cleanup has expanded its research footprint without the need for dedicated research vessels, thereby reducing operational costs and increasing data scalability. This approach has enabled the organization to map global plastic densities more accurately, facilitating targeted cleanup operations and strategic planning. Additionally, partnerships with tech entities like Microsoft's AI for Earth initiative have further bolstered the project's technological infrastructure, contributing to the development of machine learning models and cloud computing solutions to quantify and track plastic pollution. The integration of AI and robotics has not only streamlined operational efficiency but also amplified the global impact of The Ocean Cleanup's mission. This case study highlights the transformative potential of AI-driven robotics in environmental conservation, providing a scalable and cost-effective approach to addressing complex ecological challenges.

Keywords: AI-Driven Robotics, Autonomous Debris Imaging System (ADIS), Plastic Pollution, Marine Conservation, Machine Learning, Data-Driven Decision Making

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### |416|Kenaf Fiber Reinforced Polymer Composites: An Overview of Properties, Treatments, Optimization, and Applications

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### **ABSTRACT:**

As environmentally friendly substitutes for conventional materials in a variety of industries, kenaf fiber reinforced polymer composites have attracted a lot of interest. These composites combine mechanical strength, biodegradability, and affordability. They are made from the bast fibers of the kenaf plant (Hibiscus cannabinus). However, because kenaf fibers are naturally hydrophilic, they may not create a strong enough interfacial bond with hydrophobic polymer matrices, which could compromise the performance of the composite. In order to improve fiber-matrix adhesion by eliminating impurities and raising surface roughness, a number of chemical treatments have been used, such as silane, potassium permanganate, and alkali (NaOH). Improvements in tensile strength, thermal stability, and overall composite integrity have been shown as a result of these changes. The properties of kenaf-based composites can be tailored for particular applications by optimizing processing parameters like fiber orientation, resin type, and molding conditions. These materials are now much more versatile because to advanced manufacturing techniques like 3D printing and hybrid composite fabrication. Applications are found in a number of industries, such as consumer products, construction, and automotive, where there is a growing need for high-performance, environmentally friendly materials. Notwithstanding their encouraging qualities, problems like moisture absorption, fiber quality variation, and flame retardancy still require investigation.

Keywords: Kenaf fiber, polymer composites, chemical treatments, optimization, applications, sustainability,

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### |424|Structural Performance Analysis of Cold-Rolled Steel Angle Sections under Eccentric Tensile Loads

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### **ABSTRACT:**

Several factors such as size, material properties, and loads applied would determine the amount of structural performance the cold-rolled steel angles would provide for efficient designing in stable and durable performance under different loading conditions. Such a contribution toward the use of steel angle sections is present in the utilization of cold-rolled angle sections within buildings, bridges, and industrial frameworks because of their diverse shape. This paper discusses the final design strength of 24 cold-rolled steel angle sections, single and double of equal and unequal configurations. The specimens were standardized to 500 mm in length with three thicknesses, namely 2 mm, 3 mm, and 4 mm whose tensile loading is eccentric connected to a 12 mm thick gusset plate. The results showed that double angles with a lip top generally had higher design strength. Specifically, the DA3 configuration has the largest strength which it recorded a maximum increase of 4.28% of the other configurations. Single lip-topped angles also had tremendous increases in strength. Strength increases by the 50x50mm section were more elevated by 7.98% compared to a lipless configuration. The highest strength increase relative to the lipless version occurred at a single angle, 70x70 mm with a lip, of 28.35%. For single angles without lips, design strength increased with thickness but only to a threshold; in this case, the greatest strength occurred for the 70x70 mm dimension. Performance deteriorated beyond that size.

Keywords: Cold-rolled steel, angle sections, buckling, Indian standards, IS 801:1975, finite element analysis.

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## | 452 | Impact of Nano-Silica on the Microstructure and Durability of High-Performance Concrete

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### **ABSTRACT:**

The advancement of nanotechnology has opened new frontiers in concrete technology, particularly in enhancing the performance and longevity of concrete structures. This study investigates the effects of nano-silica (NS) as a partial cement replacement on the microstructure, strength, and durability of high-performance concrete (HPC). Nano-silica, known for its high surface area and pozzolanic reactivity, was incorporated at 0%, 1%, 2%, and 3% by weight of cement. Tests were conducted to evaluate compressive strength, split tensile strength, water absorption, rapid chloride penetration, and microstructural properties using Scanning Electron Microscopy (SEM) and X-ray Diffraction (XRD). The results showed a significant improvement in early and long-term strength with the inclusion of nano-silica, along with reduced porosity and enhanced durability indicators. The microstructure analysis revealed a denser matrix due to the filler effect and improved calcium silicate hydrate (C-S-H) formation. Optimal performance was observed at 2% nano-silica content. This research highlights nano-silica's potential in developing durable, high-performance, and sustainable concrete, paving the way for its application in critical infrastructure such as high-rise buildings, bridges, and marine structures.

Keywords: Nano-silica, high-performance concrete, durability, microstructure, pozzolanic materials, cement replacement, nanotechnology in concrete.

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20 – 29 Julie 2023

## |0465| "Experimental Investigation on The Strength of Concrete by Using Jute and Coconut Fibers"

Dr. Jayant Supe<sup>1, #</sup>, Alok Kumar<sup>2</sup>, Dr. Farhan Khan<sup>3</sup>, K L Janghel<sup>4</sup>, Reman Kumar<sup>5</sup>, Pravin Wasnik<sup>6</sup>.

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### **ABSTRACT:**

In present, concrete is used for construction widely, and main aim is to decrease the cost of construction. To overcome the cost of concrete various materials are replaced with concrete ingredients and waste materials are widely used to optimize the concrete cost. Natural Coconut fiber, obtained from unripe coconut, extracted from the husk of coconut. Coconut fiber is waste material i.e. residue of coconut during their creation. In present time there is boost to use waste material to innovate new materials to strengthen the product. Natural material/fiber should be used in the construction industry as it finds low cost and improve the properties of the material. Jute and coconut fiber is used in research study and carried out an experimental investigation on the mechanical properties of the jute and coconut fiber reinforced concrete (JCFRC). Natural available jute and coconut fibers was chopped to the desired length (30 mm) and it was mixed in concrete to produce JCFRC. The chopped jute fibers added in three different percentages for jute i.e. 0%, 1.0%, & 1.5%, 2 % and coconut i. e. 0 %, 1.5 %, 1%, 1.5%, 0% (by weight of cement) in five various concrete mixes (M30). Aim of this study to analyze the effect of jute fiber reinforcement on the strength properties of concrete. Workability, Flexural, split tensile and compression characteristics of the fiber reinforced concrete are measured experimentally. Workability results shows that the slump value (workability) reduced as an increased amount of jute and coconut fibers in the concrete specimens. The strength of concrete is determined at 7days, 14days and 28 days curing. Additionally, Jute and coconut fiber increased the compressive and tensile strength of every concrete mix. This research study published that natural fiber (jute and coconut fibers) can be used as additives to enhance the durability and strength of concrete.

Keywords: Waste material, Natural Coconut fiber, husk, jute fiber, Workability, Flexural, split tensile, compression strength.

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TRACK 5 - INTERNATIONAL
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IN BUSINESS MANAGEMENT AND
HUMANITIES FOR SUSTAINABLE
DEVELOPMENT



### | 0090 | Negotiating Identity and Displacement: A Comparative Study of Diasporic Consciousness in Jhumpa Lahiri's The Namesake and The Lowland

Mitali Singh<sup>1</sup>, Sampada Risbud<sup>1</sup>, Neeta Pandey<sup>2</sup>, Neha Joshi<sup>1</sup>, Pew Majhi<sup>1</sup>

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#### **ABSTRACT:**

This study offers a comparative examination of Jhumpa Lahiri's \*The Namesake\* and \*The Lowland\*, focusing on how themes of identity and displacement are represented within diasporic experiences. Utilizing frameworks from postcolonial and diaspora studies, the paper investigates the ways in which Lahiri's characters confront cultural dissonance, generational rifts, and a persistent sense of alienation in transnational settings. \*The Namesake\* emphasizes the immigrant journey of Indian-Americans across generations, portraying how names, traditions, and familial expectations shape personal identity. In contrast, \*The Lowland\* delves into the psychological aftermath of political unrest and exile, exploring how historical trauma and ideological choices influence diasporic consciousness.

This research further explores how Lahiri intertwines personal memory with collective history, creating layered narratives that transcend simple binaries of home and abroad. Her protagonists do not merely migrate physically but are also engaged in a continuous negotiation of emotional belonging. Through detailed textual analysis, the study contends that Lahiri challenges conventional diaspora narratives by highlighting emotional and psychological displacement over physical migration. Her work disrupts static notions of cultural identity and instead proposes a dynamic, evolving subjectivity shaped by fragmentation, adaptation, and resilience.

**KEYWORDS:** postcolonial and diaspora studies, immigrant journey of Indian-Americans across generations

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### | 0103 | Deep Conversation: Mechanisms of Meaningful Interpersonal Exchange in the Digital Age

Sampada Risbud<sup>1</sup>, Mitali Singh<sup>2</sup>, Dr Pew Maji<sup>3</sup>, Livish Induria<sup>4</sup>, Neha Joshi,<sup>5</sup> Monika Gupta<sup>6</sup>

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#### **ABSTRACT:**

This paper aims to furnish the new concept of communication or conversation viz Deep Communication. it is one of the hidden types of communication. As communication is the process of interchanging thoughts and ideas. It is one of the types of conversation which follows a series of events. Deep conversation is an exchange that goes beyond surfacelevel, small talks and information sharing to explore meaningful dimensions of human experience. Unlike concepts such as "emotional intelligence" (coined by Peter Salovey and John Mayer) or "flow state" (coined by Mihaly Csikszentmihalyi), "deep conversation" emerged more organically in common language usage. This can be termed as "super communication" that relies on recognizing the types like practical, emotional, or social communication. This study focuses on how this type of conversation has direct stimulation on emotions, and emerges with a new concept of communication i.e. deep conversation. This also helps to resolve and determine the queries like how technology affects the depth and quality of interpersonal communication, the cognitive and social processes that enable meaningful exchanges in such specific conditions to draw comparisons between digital and face-to-face deep conversations, and to demonstrate its relationship with Emotional intelligence.

Keywords: Deep communication: surface level, super communication, deep conversation.

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### | 0112 | A Study on Consumer Experience with AI-Powered Conversational Messaging and Chatbots: Analysing User Interaction and Satisfaction

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#### **ABSTRACT:**

The surfacing of artificial intelligence (AI) has changed the customer experience network. Amalgamation of AI with chatbots and virtual assistants as powerful tools to improve customer service, provide customized experiences, and shorten communication processes. The current research study examines the multi-dimensional role of artificial intelligence, namely chatbots and virtual assistants, in influencing consumer behaviour in the context of customer experience. This research will highlight the new dynamics of the business-customer relationship in the digital age by measuring how these technologies are aiding in this process. This research paper seeks to give input and insight into how artificial intelligence, chatbots, and customer experience interact with each other. By decomposing the complex way in which such technologies form consumer action, companies can draw significant insights for navigating the digital environment through increased efficiency, personalized interactions, and better customer service. Understanding the effect of AI on customer behaviour is essential for companies are fanatical on remaining relevant and providing world-class customer experiences.

Keywords: Artificial Intelligence, Conversational Agents, Virtual Assistants, Chatbots, Automation, Human-Computer Interaction, Personalized User Experiences.

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### | 0142 | Developing Students Verbal Communication Skills and Speech Etiquette in English Language Teaching

Neha Joshi<sup>1</sup>, Pew Maji<sup>2</sup>, Livish Induriya<sup>3</sup>, Sampada Risbud<sup>4</sup>, Mitali Singh<sup>5</sup>, Suchita Roy<sup>6</sup>

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#### **ABSTRACT:**

Speaking politely, respectfully, concisely, and using appropriate language makes communication effective. This study focuses on the importance of speech etiquette within the context of English Language Teaching (ELT). The significance of developing students' verbal communication skills is the need of the hour. The essay demonstrates how educators can support pupils in honing their verbal communication abilities. The practical and efficient English language teaching strategies must be employed to help pupils improve their speech etiquette and verbal communication abilities. Speech etiquette plays a significant role in an individual's life. The linguistic and cultural picture of the world includes speech etiquette, and people's behaviour determines their knowledge and proficiency in it. In the acquisition of foreign languages, speech etiquette plays a very significant role. The study points to important research findings, theoretical viewpoints, and instructional techniques that promote improved verbal communication. It also emphasizes that speech etiquette is vital to effective communication, including manners, taking turns, and tone. Along with helpful suggestions for teachers, difficulties in instructing and evaluating these abilities are discussed. The collected results support learner-centred, culturally sensitive, and communicative approaches in English Language Teaching (ELT).

Keywords: English Language Teaching Strategies; Verbal Communication Skills; Speech Etiquette

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### | 0166 | Equitable Urban Planning through AI-Driven Land Use Analysis

Neha Kumari<sup>1,#</sup>, Ambika Singh Sengar<sup>2</sup>, Priyank Kumar Sahu<sup>3</sup> Rubi Kambo <sup>4</sup>, Aashutosh Tandan<sup>5</sup>, Bhawana Meher <sup>6</sup>

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### **ABSTRACT:**

The rapid pace of urban growth has often resulted in imbalanced development, where certain populations lack access to essential services, green areas, and efficient infrastructure. Equitable urban planning focuses on creating cities that serve all communities fairly, especially those historically underserved. This paper investigates how the integration of Artificial Intelligence (AI) with land use analysis tools can support more inclusive and sustainable urban planning practices. By utilizing AI techniques such as machine learning and neural networks alongside Geographic Information Systems (GIS), planners can process complex spatial and demographic data to uncover patterns of inequality and make better-informed decisions. The discussion explores how AI can enhance the accuracy and speed of identifying underserved regions, forecasting urban expansion, and optimizing land resource distribution. While the benefits are significant, this paper also acknowledges the challenges, including algorithmic bias, ethical concerns regarding data privacy, limited transparency in AI models, and unequal access to digital infrastructure. Addressing these concerns is critical to ensuring that AI tools are used responsibly and effectively. The paper concludes that when applied thoughtfully, AI-driven land use analysis holds great potential to support fairer, greener, and more resilient urban environments. It emphasizes the importance of ethical frameworks and community participation in guiding this technological transformation.

*Keywords:* Equitable Urban Planning, Artificial Intelligence (AI), Land Use Analysis, Geographic Information Systems (GIS), Algorithmic Bias.

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## | 0175 | Role of NEP 2020 in Shaping the Future of Education: its impact and implication

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#### **ABSTRACT:**

A nation must have a clear, forward-thinking education policy at the education levels since education promotes social and economic advancement. This study's main goal is to identify the educational implications of the Bhagavad Gita, specifically in relation to the 'Pedagogy' component for the effective execution of India's National Education Policy-2020. A major plan to overhaul the Indian educational system is the National Education Policy (NEP) 2020. A new curriculum that is more student-focused, versatile and allinclusive is being implemented as one of the main components of NEP 2020. NEP 2020 encourages student's critical thinking, creativity and problem-solving abilities. Additionally, the curriculum highlights the value of developing 21st-century skills, vocational education and burden free education. However, the successful execution of the suggested solutions has been hampered by the lack of infrastructure and resources in many regions of the nation. There are also a number of advantages to using technology to implement the NEP 2020 curriculum. Particularly in isolated and underprivileged places, technology can improve the calibre and accessibility of education. Additionally, technology may give students access to a wealth of resources and allow them to study whenever it is most convenient for them. With consideration for the Indian Constitution's clauses, this paper provides insight into the country's educational strategy. This will help officials to investigate the document's shortcomings and identify areas that want improvement.

**KEYWORDS:** Education Policy, Student-Focused, Problem-Solving Abilities, Technology.

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### | 0185 | Government Support vs Ground Reality: A Critical Evaluation of Poverty Alleviation Measures

Ankesh Kumar Shukla<sup>1</sup>, Trisha Parashar<sup>2</sup>, Ashutosh Yadav<sup>3</sup>, Neha Joshi<sup>4</sup>, Suchita Roy<sup>5</sup>

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#### **ABSTRACT:**

This study explores the complex, multi-dimensional nature of poverty in India, which goes beyond income or calorie-based measures. It highlights persistent regional disparities and shows how poverty disproportionately affects children, who face overlapping challenges in health, education, nutrition, and infrastructure. These deprivations are often intergenerational, reinforcing cycles of disadvantage.

The analysis emphasizes that poverty should be understood through access to land, credit, sanitation, clean water, education, and healthcare. It also examines how compounded hardships limit social and economic mobility. The study reviews current policy responses and the role of grassroots movements in promoting accountability and more equitable public services. It calls for a broader, more inclusive understanding of poverty to guide effective solutions.

Keywords: Poverty; Education; Healthcare; Government Role

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### | 0195 | AI-Based Analysis of Student Spending Behavior: Distinguishing Needs from Wants for Financial Sustainability

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#### **ABSTRACT:**

In the age of digital transformation and increasing financial independence among youth, understanding student spending behavior has become vital for fostering long-term financial sustainability. This study explores the patterns of expenditure among students by applying Artificial Intelligence (AI)-based analytical tools to distinguish between essential (needs) and non-essential (wants) expenses. The research leverages machine learning algorithms to analyze survey data collected from college students, identifying key factors that influence their spending decisions. By classifying and clustering expenditure patterns, the study reveals insights into how socio-economic background, digital payment usage, peer influence, and marketing exposure affect financial choices. The findings aim to promote financial literacy and encourage responsible consumption habits among students. This research not only highlights the practical application of AI in behavioral analysis but also contributes to sustainable development by equipping the youth with knowledge and tools for mindful financial planning.

Keywords: Student Spending Habits; Needs vs Wants; Money Artificial Intelligence; Financial Education

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### | 0210 | Smart Electricity Billing System

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#### **ABSTRACT:**

In this paper, we have introduced a Smart Electricity Billing System which will automate the old electricity billing system and make it more efficient. The system allows for the accurate and efficient generation of bills by automatically (or manually) calculating bills from meter readings while providing for a comprehensive record management of customers. Making interaction between users and the plugin smooth with intuitive GUI which is built with Python and Tkinter.

Apart from traditional billing, the system provides basic and simple AI capabilities for support of energy conservation and consumer awareness. These cover anomaly detection for detecting unusual consumption patterns to demonstrate potential failures or wastage and provide smart suggestions to users to manage their electricity usage using supervised machine learning methods. It relies on high-level Python libraries for data manipulation and AI capabilities, such as Pandas and Scikit-learn, which makes the system equally suited for both reunited.

Keywords: Smart Electricity Billing System, Automated Billing, Machine Learning, Energy Efficiency, Python, Tkinter, Pandas, Scikit-Learn, Sustainable Development.

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## | 0211 | Real Estate Bubbles in the Age of Technology and Sustainability: Risks, Trends, and Mitigation

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#### **ABSTRACT:**

The real estate bubble, characterized by unsustainable property price surges, poses significant economic risks, often amplified by technological advancements and sustainability trends. This presentation explores the interplay between real estate bubbles, technology, and sustainability, highlighting their roles in driving and mitigating market volatility. PropTech innovations, such as AI-driven pricing and digital transaction platforms, accelerate demand and speculative buying, inflating prices beyond fundamentals. FinTech solutions, enabling easy credit access, further fuel over-leveraging, increasing bubble risks. Blockchain-based property tokenization also encourages speculative investments, potentially destabilizing markets.

On the sustainability front, green buildings and eco-friendly urban projects command premium valuations, but overhyped developments or climate-vulnerable locations can lead to overvaluation, risking market corrections. In India, cities like Mumbai and Bengaluru exemplify these dynamics, with tech-driven demand and sustainability-focused projects pushing prices, yet facing challenges like oversupply and affordability gaps. The presentation analyzes historical cases, such as the 2008 US housing crisis, and current Indian market trends to underscore these connections. It proposes balanced approaches—stricter regulations, transparent pricing, and climate risk integration—to mitigate bubble risks while leveraging technology and sustainability for stable growth. By understanding these interconnections, stakeholders can make informed decisions to foster resilient real estate markets.

Keywords: Real Estate Bubble, PropTech, FinTech, Blockchain, Sustainability, Green Buildings, Market Volatility, Housing Crisis, India Real Estate

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### | 0217 | Smart Shop: AI-Powered Personalized Recommendation Engine

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### **ABSTRACT:**

Developing a recommendation engine that makes personalized product suggestions in realtime within the same browsing session on the e-commerce website is difficult, as there are a large number of items and users. This project aims to develop a very effective recommendation engine, based on consideration of the user preferences and similar customer profiles to make suggestions for better user experiences and boost sales.

Gathering user data such as browsing history, purchase history, product ratings, and interactions with previous recommendations. Creating a recommendation algorithm based on machine learning techniques to analyze user data and identify relevant products. Implementing the algorithm into the e-commerce platform to generate personalized recommendations for each user.

A behavior-based advisory engine is used to improve personalized product recommendations with the help of user data for a better shopping experience. This method uses collaborative filtering, and content-based filtering algorithms for better customer satisfaction and drives sales by suggesting related products. It helps users discover new products. Enhances customer retention through tailored experience.

Keywords: AI-Powered Engine, Customer Behavior Analysis, Machine Learning, Sales Boosting, User Engagement, Real-Time Recommendations.

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### | 0219 | Grow Genie: IoT Based Intelligent Lighting Solution for Modern Living

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#### **ABSTRACT:**

The advent of the Internet of Things (IoT) has revolutionized modern living by enhancing convenience, energy efficiency, and automation. This research explores an IoT-based intelligent lighting solution specifically designed to provide users with remote control of lighting systems using the Blynk mobile application. The system leverages the NodeMCU microcontroller integrated with Wi-Fi connectivity to control lights through a relay module. By using the Blynk platform, users can switch lights ON or OFF from anywhere, ensuring convenience, improved energy management, and real-time responsiveness.

Unlike advanced systems that incorporate motion or ambient light detection, this project adopts a straightforward yet effective approach by focusing on user-driven manual control. It allows users to register and log in via a simple frontend interface, ensuring secure access to lighting controls. The system architecture includes basic hardware like NodeMCU, relays, and simple wiring, making it cost-effective and easy to implement in modern households.

This study evaluates the benefits of such an IoT lighting setup, including energy conservation by eliminating unnecessary usage, enhanced accessibility, and the foundation it provides for future upgrades like automation, scheduling, or sensor integration. Through its simplicity and practicality, the system serves as an introductory step toward smart living, suitable for homes looking to adopt IoT technology without the complexity of full-scale automation.

Keywords: Internet of Things (IoT), Smart Lighting, Remote Light Control, Energy Saving, Mobile App Control, Blynk App, NodeMCU, Home Automation, Simple IoT System, Smart Home, Wireless Control, Light Switch System.

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### | 0250 | Research Gap-Analysis between Sustainable Development Goals (SDGs) & Creation and Use of Dedicated Artificial Intelligence Applications

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#### **ABSTRACT:**

Artificial Intelligence (AI) is a technology that allows computers and machines to simulate human learning, comprehension, problem-solving, decision-making, creativity, and autonomy. Examples of AI applications include self-driving cars, virtual assistants like Siri and Alexa, recommendation systems on platforms like Netflix, and AI-powered medical diagnoses. Innovations in AI continue to shape the future of humanity, society, economy, environment, and nearly every industry. In 2015, 193 UN Member States adopted the 'Agenda-2030 for Sustainable Development', which included 17 Sustainable Development Goals (SDGs) with 169 Targets and 230 Global Indicators. Many AI applications are contributing to the achievement of the SDGs, indicating strong potential for AI to play many enabling key-roles in addressing global challenges. However, the United Nations revealed that the world is severely off-track to achieve the SDG-2030 Agenda, with only 17% of the 135 targets progressing as expected by 2030. Nearly 48% of targets exhibited moderate to severe deviations from the desired trajectory, with 18% stagnating and 17% regressing below the 2015 baseline levels. Research indicates that AI applications are being developed and implemented across all 17 SDGs, with notable concentrations in certain areas. Google highlighted that the largest number of AI use cases (165) pertain to SDG 3: Good Health and Well-being, accounting for 28% of documented cases. Despite the promising potential, the actual deployment of AI solutions specifically aimed at achieving the SDGs remains noticeably limited. This paper explores the research inadequacy in the area of Sustainable Development and the implementation of dedicated AI applications needed to achieve more effectively the 17 SDGs with their targets by 2030 globally.

Keywords: Artificial-Intelligence, Narrow-AI, General-AI, Super-Intelligent AI, Generative Artificial-Intelligence, Sustainable Development Goals (SDG).

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### | 0254 | Augmented Reality (AR) in Indian E-commerce: The Impact of Virtual Try-Ons on Consumer Confidence and Purchase Behaviour

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#### **ABSTRACT:**

This study examines the influence of augmented reality (AR) virtual try-on features on perceived decision-making efficacy and subsequent purchase behaviour in India's ecommerce sector. Drawing on a quantitative, cross-sectional survey of 500 Indian online shoppers aged 18 to 45 with prior AR try-on experience, the research employs partial least squares structural equation modeling (PLS-SEM) to test a model in which AR interface usability and personalization drive perceived usefulness and trust. These mediators, in turn, shape consumer confidence and conversion outcomes, with clear evidence of reduced return rates. The findings extend the Technology Acceptance Model (TAM) to a culturally diverse and price-sensitive emerging market. In addition to theoretical contributions, the study provides actionable strategies for e-commerce firms to enhance interface simplicity and reduce operational costs.

**KEYWORDS:** Augmented Reality, Virtual Try-Ons, Consumer Confidence, Indian E-commerce, PLS-SEM

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### | 0256 | Short-Form Video Marketing Effectiveness on Gen Z: A Meta-Review Across Platforms

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#### **ABSTRACT:**

In today's rapidly evolving attention economy, short-form video marketing has emerged as an indispensable tool for engaging Generation Z consumers. Leveraging platforms such as TikTok, Instagram Reels, and YouTube Shorts, brands are harnessing the power of brevity, creativity, and algorithm-driven content distribution to communicate compelling narratives. This paper presents a comprehensive meta-review of 109 peer-reviewed studies complemented by empirical data collected from an online survey of 130 Gen Z respondents. By synthesizing quantitative findings and theoretical perspectives—primarily Uses and Gratifications Theory (UGT) and the Elaboration Likelihood Model (ELM) this study elucidates the psychological and communicative factors that enhance engagement, brand recall, and purchase intent among this demographic. Further, additional theoretical lenses, including Social Cognitive Theory and Media Richness Theory, are discussed to enrich our understanding of Gen Z's media consumption patterns. The findings indicate that user-generated content (UGC) and influencer-driven strategies outperform traditional branded advertisements, with significant platform-specific differences noted in user engagement levels. This research offers critical insights and strategic implications for marketers aiming to optimize their short-form video content to better align with Gen Z's preferences and behaviours.

KEYWORDS: Gen-Z, Meta Analysis, Short-Form Video Marketing.

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### | 0272 | Impact of AI-Driven Tax Optimization Strategies on Reducing Tax Liabilities for Salaried Employees

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#### **ABSTRACT:**

This research investigates the impact of AI-driven tax optimization strategies on reducing tax liabilities among salaried employees in India. With the advent of AI-powered tools like Tax2Win's Tax Planning Optimizer, which has assisted over 30,000 users in saving upwards of ₹62.5 crore in taxes, the study aims to evaluate the effectiveness of such technologies in personal tax planning. (Financial Express)

A paired t-test methodology was employed to compare tax liabilities before and after the implementation of AI-driven optimization strategies. The analysis revealed a statistically significant reduction in tax liabilities post-implementation, indicating the effectiveness of AI tools in identifying optimal tax-saving avenues and ensuring compliance with tax regulations.

The findings underscore the potential of AI technologies in transforming personal tax planning by automating complex calculations, identifying eligible deductions, and providing personalized recommendations. However, the study also highlights the importance of human oversight, as AI tools, while efficient, may not fully capture the nuances of individual financial situations.

In conclusion, AI-driven tax optimization strategies offer a promising approach to reducing tax liabilities for salaried employees. Nevertheless, a balanced integration of AI tools with human expertise is recommended to maximize tax savings and ensure comprehensive financial planning.

Keywords: AI-Powered Tax Optimization; Section 80C Deductions; Tax Planning Optimizer; Tax Filing Assistance

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### | 0282 | Digital Taxation and Its Influence on E-Commerce Consumer Trends

Aditya Singh<sup>1</sup>, Manoj Verghese<sup>2</sup>, Sushil Punwatkar<sup>3</sup>, Sourabh Guha<sup>4</sup>, Aditi Bhandakkar<sup>5</sup>, Diksha Singh<sup>6</sup>

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#### **ABSTRACT:**

In the digital era, taxation regulations are rapidly evolving, reshaping the e-commerce landscape in profound ways. Digital taxation reforms—designed to target online transactions more effectively—are generating significant ripple effects on consumer behaviour. These policies force digital vendors to adjust their pricing strategies, often incorporating additional tax liabilities into the final cost of goods and services. As a result, online shoppers can experience noticeable fluctuations in pricing, which directly impacts their purchasing decisions. At the same time, the clarity and consistency of these tax reforms play a critical role in shaping consumer trust. When tax policies are transparent and uniformly enforced, customers feel more confident in the integrity of digital vendors. However, if the measures seem convoluted or unfairly applied, trust can erode, prompting consumers to exercise greater caution when shopping online. This dynamic may shift consumer preferences toward domestic e-commerce platforms that offer clearer tax structures rather than global online platforms operating under diverse digital tax regimes. Exploring these impacts—on pricing, trust, and the evolving balance between domestic and international marketplaces—provides valuable insights into current consumer trends in the digital era.

Keywords: Digital Taxation, E-commerce, Consumer Behaviour, Online Pricing, Digital Vendors, Domestic E-commerce, Global Platforms, Digital Transactions.

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### | 0283 | Sustainable Management of Spent Lithium-Ion Batteries: The Role of Reverse Logistics in the Automotive Sector

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#### **ABSTRACT:**

In this age of global advancement in technology, environmental sustainability has become increasingly important. Electric vehicles (EVs) have gained popularity due to their lower carbon impact. One of the most important components of an electric vehicle (EV) is its lithium-ion battery. Increased use of lithium-ion battery (LIB) packs has produced a possible concern in the form of excess LIBs unless adequate recycling or remanufacturing procedures are followed. To repurpose previously used LIBs in an eco-friendly and efficient way, it is essential to implement appropriate reverse logistics procedures. This field of research holds significant potential for the future of the automotive sector. Inthis study, we briefly reviewed spent LIB management, recycling procedures, demographic locations, remanufacturing concerns, transportation costs, deterioration, and regulations in North America. A brief review of the reverse logistics for lithium-ion batteries improves comprehension and paves the way for future research considerations in this evolving field.

Keywords: lithium-ion battery (LIB) production; reverse logistics; LIB management hierarchy; second life of spent LIBs; recycling spent LIBs; LIB transportation for recycling; regulation.

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### | 0286 | Beyond the Page: AI-Driven Tools Restructuring the Study of Literature

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#### **ABSTRACT:**

Artificial intelligence (AI) has increasingly pervaded the Humanities recently, bringing about a deep revolution in literary studies. It has provided new methodologies and insights into the conception of literary texts and their analysis. This study explores the influence of three major AI modelled methodologies—sentiment analysis, stylometry, and automated translation—on literary scrutiny, understanding, and dissemination. The study explores how these tools integrate traditional literary criticism using case studies and theoretical contexts. The research will also study the new challenges AI can pose to authorship, interpretation, and cultural framework. Far from rendering humanistic analysis defunct, AI reformats it by offering amplified viewpoints on literary texts, tone, and translatability. The paper argues for standardizing rules and regulations for scholars to work with comprehensive AI literacy. It further advocates the need for an interdisciplinary association to confirm AI's inclusive and ethical disposition in literary research.

**Keywords:** sentiment analysis; stylometry; automated translation; authorship; translatability; AI literacy; authorship; interdisciplinary association.

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## | 0287 | The Humanistic Limits of Algorithms: Can Machines Understand Metaphor, Irony, and Ambiguity?

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### **ABSTRACT:**

Considering the growing popularity of computational critique and digital humanities in literary studies, problems arise regarding the epistemological bounds of algorithmic reading. This work investigates how different artificial intelligence and natural language processing (NLP) tools can interact with fundamental literary techniques like metaphor, irony, and ambiguity. This article critically analyses the success and shortcomings of machine learning models in deciphering figurative and layered meanings. It draws on the most recent research in cognitive linguistics, computational linguistics, and digital literary studies. Various literary works from different periods and genres are used in case studies to illustrate the possibilities and the limitations of the computational approaches that are now in use. The study concludes that even though algorithms are effective at pattern identification and large-scale text analysis, they are not competent enough to identify subjective, context-dependent, and frequently contradictory aspects of literary texts. These are components that are essential to humanistic interpretation.

Keywords: Digital Humanities; Computational Criticism; Natural Language Processing (NLP); Metaphor; Irony; Ambiguity; AI Interpretation; Literary Analysis; Algorithmic Reading; Epistemology

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## | 0293 | Service Marketing Mix Strategy and Service Loyalty towards Hotel's Success

Aditi Bhandakkar<sup>1</sup>, Sushil Punwatkar<sup>2</sup>, Sourabh Guha<sup>3</sup>, Diksha Singh<sup>4</sup>, Tusshar Yadav<sup>5</sup>, Sakshi Verma<sup>6</sup>, Kritika Sahu<sup>7</sup>

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#### **ABSTRACT:**

The contribution from service sector is very effective in supporting income growth of a particular country. Hospitality industry has become a mainstay of some developing countries. Hotel services are capable of providing vast employment opportunities, thus demanding the availability of human resources capable of rendering hotel services professionally. The finest services being offered are expected to create service success. The purpose of this research is to identify whether the implemented service mix strategy has an impact on service loyalty and the achievement of service success. The study was conducted on four-star hotels in Raipur. The research findings show that service mix strategy has a significant and positive effect on service loyalty. This means, the better or the more precise the implementation of a four-star hotel service mix strategy is, the greater the opportunity to create service loyalty. Service marketing mix strategy influences service success. Loyalty towards hotel services is capable of promoting service success, which means that the more loyal a hotel guest is, the more a hotel is capable of generating service success. There is a positive relationship between service marketing mix strategy and service success when mediated by service loyalty.

**Keywords:** Service Marketing Mix, Service Loyalty, Hotel/Hospitality Industry, Mediation.

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## | 0294 | Money, Mentors, and Markets: The Success Formula for Women-Led Enterprises in Emerging Economies

Manoj Verghese<sup>1</sup>, Sushil Punwatkar<sup>2</sup>, Sourabh Guha<sup>3</sup>, Aditi Bhandakkar<sup>4</sup>, Diksha Singh<sup>5</sup>, Aditya Singh<sup>6</sup>

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#### **ABSTRACT:**

Women entrepreneurs play a crucial role in driving economic growth and innovation in emerging markets, yet they continue to face significant challenges in accessing financial resources and social support. This study examines the impact of financial access and social support on the business performance of women entrepreneurs in emerging markets through an empirical approach. Key independent variables include access to funding, social networks and mentorship, and government policies supporting women entrepreneurs, while business growth and sustainability serve as the dependent variables. Using a structured survey methodology with responses measured on a Likert scale, this research aims to evaluate the extent to which financial accessibility and social support contribute to entrepreneurial success. Findings from regression analysis will help determine the relationship between these variables and provide insights into the effectiveness of government initiatives and external networks in fostering sustainable businesses. The study seeks to highlight critical barriers faced by women entrepreneurs and propose actionable solutions to enhance their access to resources. By bridging existing gaps in financial inclusion and community-based support, this research aims to contribute to policy improvements and empower women entrepreneurs to thrive in dynamic and evolving economic environments.

**KEYWORDS:** Women Entrepreneurs, Financial Access, Social Support, Business Performance.

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## | 0296 | The Ethics of AI and Its Implications for Political Power

Praveen K Mishra<sup>1</sup>, Satyaveer Singh Rathore<sup>2</sup>, Jyoti Tiwari<sup>3</sup>, Anjali Patel<sup>4</sup>, Sangeeta Chauhan<sup>5</sup>, Savita Pandey<sup>6</sup>

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### **ABSTRACT:**

The rapid integration of artificial intelligence (AI) into governance, surveillance, and public discourse raises profound ethical questions about its impact on political power. This paper examines how AI-driven technologies—such as predictive policing, algorithmic governance, and microtargeted propaganda—reshape democracy, accountability, and social control. While AI offers potential benefits like optimized policy-making and enhanced civic engagement, its misuse risks entrenching authoritarianism, eroding privacy, and amplifying systemic biases. Key concerns include the centralization of power in tech elites, the manipulation of voter behaviour through hyper-personalized disinformation, and the opacity of algorithmic decision-making in public institutions. Drawing on case studies and ethical frameworks, this study argues for stringent regulatory oversight, transparency in AI deployment, and democratic safeguards to prevent AI from becoming a tool of oppression. The findings underscore the urgent need for an ethical AI governance paradigm that balances innovation with human rights, ensuring technology serves pluralistic democracy rather than unchecked political dominance.

Keywords: AI Ethics; Political Power; Algorithmic Governance; Surveillance Capitalism; Disinformation; Democratic Accountability

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## | 0298 | Comparative Study of Students Sense of Moral Responsibility

Pratibha Prajapati<sup>1</sup>, Ranjana Patel<sup>2</sup>, Vani Kapse<sup>3</sup>, Geetika Agrwal<sup>4</sup>, Rita Gupta<sup>5</sup>, Kiran Tiwari<sup>6</sup>

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### **ABSTRACT:**

This study explores the differences the sense of moral responsibility among higher secondary school students. Moral responsibility, a key component of character education, plays a vital role in shaping students' ethical behaviours and social conduct. The research aims to compare how male and female students, as well as students from government and private schools, perceive and practice moral responsibility. Descriptive survey method has been used for the study. Moral Values Inventory (MVI) developed by S. Aggarwal has been used for measuring sense of moral responsibility. In this study Total 120 students (60 from government schools and 60 from private schools) have been selected by random sampling method. The results show that there is a significant difference in moral responsibility linked to gender and school type, with female students and those from private schools generally showing a higher sense of moral responsibility. These results have important implications for educators and policymakers in designing moral education programs that address these differences effectively.

Keywords: Moral responsibility, Students, higher secondary School.

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## | 0299 | Impact and Utility of Artificial Intelligence on Teaching

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### **ABSTRACT:**

This study explores the impact and utility of Artificial Intelligence (AI) in teaching through a comparative analysis of government and Private school teachers in Durg district, Chhattisgarh. A structured questionnaire consisting of 20 Likert-scale items (scored from 1 to 5) was administered to a sample of 100 teachers—50 from government schools and 50 from Private (private) schools. The questionnaire focused on two core variables: the utility of AI in day-to-day teaching and its impact on overall teaching effectiveness. Statistical analysis using an independent sample t-test revealed a significant difference in perception between the two groups, with Private teachers reporting greater adoption and perceived benefits of AI technologies. These findings point toward critical disparities in infrastructure, training, and institutional support, underlining the need for inclusive strategies to promote AI adoption in the public education sector of Durg.

Keywords: Artificial Intelligence (AI), Teaching Effectiveness, Utility of AI, Government Schools, Private Schools, Independent Sample t-test, Teachers' Perception, Educational Technology, Statistical Analysis, Durg District.

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## | 0301 | The Impact of AI on the Education System: Positive and Negative Aspects

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#### **ABSTRACT:**

The integration of Artificial Intelligence (AI) into the education system has brought transformative changes, offering both opportunities and challenges. This paper examines the dual impact of AI on education, highlighting its potential to enhance personalized learning, automate administrative tasks, and provide data-driven insights for educators. AI-powered tools, such as intelligent tutoring systems and adaptive learning platforms, enable tailored instruction, improving student engagement and outcomes. However, the increasing reliance on AI also raises concerns, including data privacy risks, algorithmic bias, and the potential reduction of human interaction in learning environments. Additionally, the digital divide may widen as unequal access to AI technologies exacerbates educational inequalities. By analysing current implementations and ethical considerations, this study underscores the need for balanced adoption—leveraging AI's benefits while addressing its drawbacks through policy frameworks, equitable access, and teacher training. The findings suggest that AI can revolutionize education if deployed responsibly, ensuring inclusivity and preserving the human element of teaching.

Keywords: Artificial Intelligence; education technology; personalized learning; algorithmic bias; digital divide; ethical AI; adaptive learning.

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## | 0312 | Framing Femininity: Objectification and Subjugation in Media

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#### **ABSTRACT:**

The aim of this article is to highlight the role of media which has played a significant role in shaping societal perceptions of gender, often reinforcing patriarchal structures through the themes of 'Objectification' and 'Subjugation' of women. The portrayal of women in society, whether in media or in real life, shapes public perception and reinforces the limitations placed on women's roles. This current research study will employ qualitative research methodology which will be including content analysis and feminist critical discourse analysis to examine how traditional media narratives depict women in passive, subservient roles. Despite long-standing portrayals in media, there's been a growing movement towards more inclusive and progressive representation. The growing awareness of feminist ideals and media literacy has led to a greater demand for female characters in films, television, and literature that are both diverse and empowering. Women are breaking away from traditional portrayals, taking on leadership, combat roles, and decision-making positions. By creating compelling, multifaceted female characters and promoting stories that consider gender perspectives, it can challenge existing stereotypes and foster a more inclusive media environment.

Keywords: Discrimination, Media, Objectification, Subjugation, Stereotypes.

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## | 0313 | Cryptocurrency vs. Traditional Asset Classes: A Comparative Risk Analysis

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#### **ABSTRACT:**

This research paper explores the comparative risk profiles of cryptocurrencies versus traditional asset classes such as stocks, bonds, and gold. As cryptocurrencies like Bitcoin and Ethereum have grown in popularity, questions surrounding their viability as investment assets have intensified. Using a combination of historical price data, volatility metrics, and risk-adjusted performance indicators such as the Sharpe ratio and Value-at-Risk (VaR), this study examines how cryptocurrencies stack up against established asset classes. The analysis reveals that while cryptocurrencies offer the potential for high returns, they exhibit significantly higher volatility and risk. The findings suggest that cryptocurrencies may be more suitable for speculative investors rather than those seeking portfolio stability. The paper concludes with implications for individual investors, institutional participants, and policymakers, and provides recommendations for future research in the evolving digital asset space.

Keywords: Cryptocurrency, Traditional Assets, Risk Analysis, Bitcoin, Ethereum, Sharpe Ratio, Value-at-Risk, Volatility, Portfolio Management, Financial Instruments.

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## | 0327 | The Impact of Artificial Intelligence (AI) Into the Future of Democracy and Civil Participation

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#### **ABSTRACT:**

AI is a vast and advance field that enclose various subfields like machine learning, deep learning, natural language processing, computer vision, and robotics. The future of democracy holds immense potential for citizen empowerment, responsive governance, and global participation. The paper tries to focus on the importance of Artificial Intelligence in the contemporary times. The impact of AI into the future of democracy and civic participation is a complex and miscellaneous issue with both promising potential and significant risks. Therefore, the paper extracts all the possible aspects viz, positive as well as negative aspects to show the impact of AI in the Indian democratic system. Further, the paper deals with the futuristic ways of democracy and its development including civic participations.

Keywords: Artificial intelligence, civic participation, democracy, development.

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### | 0347 | The Impact of AI-powered Surveillance on Social Control and Individual Freedoms

Aditya Kumar<sup>1</sup>, Sushma Shrivastava<sup>2</sup>, Jyoti Tiwari<sup>3</sup>, Trupti Suryavanshi<sup>4</sup>, Savita Pandey<sup>5</sup>, Bindu Kashyap<sup>6</sup>

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#### **ABSTRACT:**

The rapid advancement of AI-powered surveillance technologies has significantly transformed social control mechanisms, raising critical concerns about individual freedoms and privacy. This paper examines the dual-edged nature of AI surveillance, analysing its potential to enhance security while simultaneously enabling unprecedented levels of state and corporate oversight. By exploring case studies, legal frameworks, and ethical implications, the study highlights how mass data collection, facial recognition, and predictive policing algorithms reinforce authoritarian tendencies and erode civil liberties. Furthermore, the paper discusses the psychological and societal effects of pervasive surveillance, including self-censorship and behavioural modification. The findings suggest that without robust regulatory safeguards, AI-driven surveillance risks entrenching systemic oppression under the guise of efficiency and security. The study calls for a balanced approach that prioritizes human rights, transparency, and democratic accountability in the deployment of surveillance technologies.

Keywords: AI surveillance; social control; privacy; individual freedoms; predictive policing, ethics; human rights.

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## | 0350 | The Impact of Hypertext, Interactive Fiction, and Digital Storytelling on Narrative Theory

Satyaveer Singh Rathore<sup>1</sup>, Praveen Kumar Mishra<sup>2</sup>, Shushma Shrivastava<sup>3</sup>, Jyoti Tiwari<sup>4</sup>, Savita Pandey<sup>5</sup>, Sangeeta Chauhan<sup>6</sup>

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### **ABSTRACT:**

The rise of hypertext, interactive fiction, and digital storytelling has fundamentally challenged and expanded traditional narrative theory, necessitating new frameworks to account for nonlinearity, interactivity, and reader agency. This paper examines how these digital forms disrupt classical notions of plot, authorship, and textual stability, drawing on theories from cyphertext, and poststructuralism. Hypertext fractures linear causality, transforming readers into co-navigators of fragmented narratives, while interactive fiction (e.g., \*Twine\* games, choice-based narratives) introduces ludic elements that blur the boundaries between storytelling and gameplay. Digital storytelling platforms further democratize narrative production, enabling collaborative, multimodal, and algorithmically generated stories that defy fixed interpretations. Through case studies and theoretical analysis, this study explores tensions between emergent narratives and authorial control, the role of procedural rhetoric in meaning-making, and the ontological shifts in character and temporality within digital environments. The findings argue for a paradigm shift in narratology—one that embraces fluidity, user embodiment, and computational media as central to 21st-century storytelling.

Keywords: narrative theory; hypertext; interactive fiction; digital storytelling; procedural rhetoric; nonlinear narrative.

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## | 0351 | Unleashing the Power of AI: Transforming Education Assessment with Personalization

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#### **ABSTRACT:**

Artificial Intelligence (AI) is revolutionizing educational assessment by enabling dynamic, personalized learning experiences tailored to individual student needs. This paper explores how AI-driven tools—such as adaptive testing, real-time feedback systems, and predictive analytics—are reshaping traditional assessment methods, moving beyond one-size-fits-all evaluations to foster deeper engagement and mastery. By leveraging machine learning and data analytics, AI enhances precision in tracking progress, identifying learning gaps, and offering customized interventions. However, challenges such as data privacy concerns, algorithmic bias, and the potential over-reliance on automated systems must be addressed to ensure ethical and equitable implementation. Through case studies and emerging trends, this study highlights AI's transformative potential in creating more inclusive, efficient, and student-centered assessment frameworks. The findings advocate for a balanced integration of AI, emphasizing educator collaboration and robust governance to maximize benefits while safeguarding academic integrity and equity.

Keywords: AI in education; personalized assessment; adaptive learning; real-time feedback; predictive analytics; ethical AI; educational equity.

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## | 0359 | A Study on the Level of Social Skills Among Adolescents in Durg District

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#### **ABSTRACT:**

Social skills are essential interpersonal abilities that allow individuals to interact effectively and harmoniously with others. Adolescence is a critical stage of emotional, psychological, and social development—social skills play a particularly vital role. social skills are not only crucial for individual development but also for fostering a healthier and more cooperative society. They form the foundation for personal, academic, and professional success throughout life. The present study was conduct to know the difference of social skills at different dimensions, among adolescent students of higher secondary school. The present study was conduct to a stratified random sampling of 100 students of higher secondary school of Durg District in Chhattisgarh. In this study Social Skill Rating Scale tool was used that is developed by Vishal Sood and Arti Anand. The data were analysed by employing mean, S.D, T-Test, and percentage The result of this study showed significant difference are found at different dimensions of social skills of male and female. The findings of this study emphasize the importance of developing holistic educational approaches that address not only academic growth but also social and emotional competencies. Schools in Durg district can greatly benefit by implementing policies and practices that promote the social well-being of adolescents.

Keywords: Social Skill, Higher Secondary School, Communication Skill, Decision Making Skill.

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# | 0360 | Empowering Women: Advancing Diversity and Inclusion through Development and Engagement Initiatives

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#### **ABSTRACT:**

This review paper explores the critical role of advancing women's development and involvement through diversity and inclusion (D&I) initiatives within contemporary organizational contexts. As organizations increasingly recognize the multifaceted nature of diversity, they must also prioritize gender inclusion to drive innovation and performance. The chapter outlines key strategies for promoting women's advancement, including mentorship, sponsorship, leadership development programs, and inclusive recruitment practices that reduce biases. It highlights the benefits of gender-diverse teams, such as improved problem-solving, decision-making, and overall organizational effectiveness. However, the chapter also addresses challenges, such as resistance to change, tokenism, and the complexities of balancing various forms of diversity. To overcome these obstacles, the chapter emphasizes the need for genuine, transparent D&I practices and strategic measurement of progress through clear metrics and regular reporting. By analysing successful case studies and offering practical recommendations, this chapter provides a comprehensive roadmap for organizations aiming to foster an inclusive environment where women can thrive. Empowering women is not just an ethical imperative; it is a strategic advantage that enhances organizational culture, drives innovation, and contributes to sustainable success.

Keywords: diversity and inclusion, women's development, mentorship and sponsorship, inclusive recruitment, organizational performance.

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## | 0366 | AI-Enabled Blue Ocean Strategies in Emerging Markets: A Pathway to Sustainable Growth

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#### **ABSTRACT:**

In today's highly competitive global environment, traditional market strategies often lead to saturated markets and diminishing returns. Blue Ocean Strategy offers a compelling alternative by advocating the creation of uncontested market spaces through innovation and differentiation. This research explores how Artificial Intelligence (AI) can enhance the development and execution of Blue Ocean Strategies in emerging markets, where resources are limited but opportunities for growth remain vast. The study investigates whether AIdriven strategic interventions—such as predictive analytics, customer segmentation, innovation forecasting, and automated market research—can help businesses in emerging markets break away from the competitive "red ocean" and move toward sustainable, innovation-led growth. Using a paired t-test methodology, the research evaluates the performance of 50 small and medium enterprises (SMEs) across various industries before and after the implementation of AI-enabled Blue Ocean initiatives. Key performance metrics including revenue growth, market share, customer acquisition, and product innovation rates were measured over a 12-month period. The statistical analysis revealed a significant improvement in these indicators post-intervention, supporting the hypothesis that AI not only facilitates the identification of blue oceans but also strengthens strategic agility and execution in dynamic environments. The findings offer practical insights for business leaders and policymakers on how to combine strategic thinking with emerging technologies to drive long-term sustainability, competitive differentiation, and inclusive economic growth in developing economies.

Keywords: Artificial Intelligence, Blue Ocean Strategy, Emerging Markets, Sustainable Growth, Paired t-Test, Strategic Innovation, Business Performance

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## | 0367 | Effect of 'Al for All' Programme on Change in Attitude Towards Change in Using Educational Media.

Rita Gupta<sup>1</sup>, Ranjana Patel<sup>2</sup>, Geetika Agrawal<sup>3</sup>, Vani Kapse<sup>4</sup>, Pratibha Prajapati<sup>5</sup>, Tuman Patel<sup>6</sup>

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### **ABSTRACT:**

This study explores the effect of Al for all programme on change in attitude towards using educational media of CBE and CG board school's teacher in Bhilai city. Experimental study was conducted between two group. Experimental group was completed both 'Al of for all' module and control group in same school. Intact sampling technique was used to collect data and Attitude towards using educational media (Likert scale consisting 30 items stored 1to5) made by Lodhi and Subahi Khan was used. 100 teacher and 20 principals from CBSC and CG board was taken as a sample. Two equal group was made as experimental and control group. significant difference between mean of score of each group was found in favour of experiment. Al for all programme as is effective and need to promote in public to achieve target of Digital India by 2047 as per new education policy.

Keywords: Artificial intelligence, AI for all, school teacher, attitude towards change in using of educational media, experimental study.

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## | 0368 | Integrating Artificial Intelligence in the Classroom to Enhance Sustainability Education: An Effectiveness Study

Sakshi Verma<sup>1</sup>, Sakshi Mandpe<sup>2</sup>, Tusshar Yadav<sup>3</sup>, Diksha Singh<sup>4</sup>, Aditi Bhandakkar<sup>5</sup>, Kritika Sahu<sup>6</sup>

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### **ABSTRACT:**

The integration of Artificial Intelligence (AI) in educational environments presents a promising opportunity to transform how sustainability is taught and understood by students. This study investigates the effectiveness of using an AI-powered learning module to enhance students' awareness and understanding of sustainability concepts in a classroom setting. A pre-test/post-test design with a paired t-test analysis was employed to evaluate the impact of the AI intervention among undergraduate students enrolled in business and humanities courses. The AI module provided interactive content, personalized feedback, and real-time support tailored to the learning pace of each student. Results revealed a statistically significant improvement in students' post-intervention test scores, suggesting that AI-enhanced learning can positively influence sustainability education outcomes. The findings support the potential of AI as a pedagogical tool for advancing sustainability literacy, particularly in higher education settings. The study concludes with recommendations for integrating AI in curriculum design to foster greater engagement and long-term understanding of sustainable development goals.

Keywords: Artificial Intelligence, Sustainability Education, Classroom Learning, Higher Education, Educational Technology, Paired t-Test, Sustainable Development Goals (SDGs), AI in Pedagogy.

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## | 0442 | Sustainable Narratives: The Role of AI in Reimagining Myth and Memory

Ashok Kumar<sup>1</sup>, Seema Arora<sup>2</sup>, Anil Manjhi<sup>3</sup>

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#### **ABSTRACT:**

In a period characterised by technical advancement and environmental necessity, the reexamination of cultural narratives using artificial intelligence (AI) presents transformative opportunities for sustainability. Myths, conveyed through oral and written traditions, have historically functioned as stores of collective memory, ethics, and ecological consciousness. This study examines the utilisation of AI technologies—namely machine learning, natural language processing, and generative models—in the preservation, reinterpretation, and revitalisation of tales in modern contexts. By reinterpreting myths using AI-driven platforms, civilisations can re-establish connections with ancient wisdom while promoting novel strategies for environmental awareness and cultural sustainability. The research analyses instances when AI has been employed to create myth-inspired literature, visual storytelling, or immersive experiences that advocate for ecological principles and inclusive stories. It also examines the ethical and epistemological aspects of permitting technology to mediate cultural memory. In what ways can algorithmic interpretation influence authenticity, ownership, and the transmission of myth? Can AI serve as a custodian of intangible legacy or simply as an imitator? These enquiries direct the research as it explores the interconnections of digital humanities, environmental ethics, and cultural preservation. The study makes the case that sustainable narratives arise not only from ecological messages but also from the long-term transmission of values and memories across generations by presenting AI as a technological and cultural tool. In the end, this study highlights how AI may serve as a link between innovation and tradition in creating a more sustainable and thoughtful future.

Keywords: Artificial Intelligence, Cultural Memory, Myth, Sustainability, Digital Humanities, Narrative Reinterpretation

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## | 0444 | Digital Humanities and Transgender Narratives: Applying AI to Gérard Genette's Narrative Categories in 'I Am Vidya'

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### **ABSTRACT:**

This study examines how transgender identity, narrative theory, and digital humanities intersect by analysing Living Smile Vidya's I Am Vidya: A Transgender's Journey. Using the narrative categories developed by Gérard Genette—voice, mood, frequency, order, and duration—the study explores how narrative structure affects how societal opposition and gender transformation are portrayed. The study uses easily accessible digital tools such as Voyant Tools, AntConc and NLP to identify recurrent marginalisation motifs, analepsis patterns, and the emotional intensity present in Vidya's homodiegetic voice. In addition to chronicling a personal experience, the study shows how Vidya's storytelling represents the transgender community in India as a whole. We look at how storey patterns influence the portrayal of transgender identities. The study looks into focalization changes, temporal distortions, and paratextual components to find out how the text defies accepted narrative norms. This research illustrates how artificial intelligence (AI) can improve close reading in transgender literary studies by fusing computational text analysis with narratological theory, providing fresh perspectives on underrepresented voices. The results show that I Am Vidya uses embodied discourse and nonlinear narration to challenge cisnormative structures and conform to queer temporalities. Through the demonstration of low-barrier tools for storey analysis and the promotion of inclusive AI applications in literary research, this study advances digital humanities approaches. This research highlights the importance of digital humanities in elevating underrepresented voices and supports the Sustainable Development Goals for gender equality and inclusion by fusing traditional narratology with computational techniques. In the era of artificial intelligence, the study offers a scalable framework for inclusive literary analysis.

Keyword: Digital Humanities, Transgender Narratives, Gérard Genette, AI Text Analysis, Queer Temporalities

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## | 0445 | Role of Artificial Intelligence in Teacher Training Course

Rita Gupta<sup>1</sup>, Subodh Paswan<sup>2</sup>, Kriti Lata Neha<sup>3</sup>, Anshu Kumari<sup>4</sup>, Hiramani<sup>5</sup>, Edil Toppo<sup>6</sup>

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#### **ABSTRACT:**

Teaching profession required enhancing the teaching skills regularly. Post covid era is become era of multichannel educational era. As per NEP 2020 classroom teaching need to change more student-centric, holistic and skill-based approach. To achieve the goal of integration of technology for teacher empowerment and professional development ai will plays important role. This study investigates the area, scope and need of ai in teacher education, enhancement in teaching skill of teacher educator, transforming classroom teaching for personalized learning experience, inclusive classroom practice, developing a culture of research and innovation in teaching practice by help of AI.

Keyword: Artificial Intelligence, Teaching Skill, Personalized Teaching, Student Centric Education, Holistic Education.

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## | 0470 | Driving Sustainability: AI-Powered Technological Innovations for Petrol Pumps within Petroleum Sector

Nagma Afroz<sup>1</sup>, Neha Soni<sup>2</sup>, Jyotirmoy Chatterjee<sup>3</sup>

#### **ABSTRACT:**

The present fuel stations are evolving globally at a higher pace with growing AI techniques ensuring enhanced sustainability of available resources. All the industries including petroleum industries also need to develop technologically keep in mind the environment sustainability in order to fulfil growing customer needs and desires. For this, the major petroleum products (including petrol and diesel) and related services needs to evolve continuously keeping in mind the best sustaining quality and quantity. Various sustainable alternatives are adopted and merged with Artificial Intelligence to cope with the best possible outcomes leading to longer resource conservation & utilisation ensuring better and modified performance for achieving higher customer satisfaction.

Keywords: Petrol Pumps, Artificial Intelligence, Customer Satisfaction, Sustainability.

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## | 0472 | Challenges and Opportunities: Implementing ATL Tinkering Labs in Rural Schools

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### **ABSTRACT:**

The Atal Tinkering Labs (ATL) initiative, under the aegis of NITI Aayog, represents a transformative step towards fostering innovation and scientific temper in Indian schools. Though most of the ATL Labs have been tested and are effective in the urban schools, there are some challenges that affect the rural schools for instance ineffective infrastructure, inadequate training and socio-economic issues. However, these schools also offer similar potential and future scope in narrowing the innovation gap in rural schools to prepare the youths for 21st century skills. This review provides a broad analysis of the research on the difficulties and benefits of using ATL Tinkering Labs in rural schools with regard to policies, roles of stakeholders, and possibilities for developing innovations. Some suggestions on how to avoid those pitfalls and ensure that ATLs may be optimally effective in rural environments are given.

Keywords: ATL Tinkering Labs; Rural Education; Innovation in Schools; STEM Education; Implementation Challenges; Opportunities in Rural Development.

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## | 0474 | The Dual Role of AI Chatbots in Enhancing Customer Service Satisfaction and Loyalty

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### **ABSTRACT:**

Artificial intelligence (AI) chatbots have become a vital component of customer service, influencing satisfaction and brand loyalty. This study examines the dual role of AI-driven customer support in shaping user experiences, focusing on response time, conversational quality, and personalization. By assessing their impact on service satisfaction, customer loyalty, and repurchase intentions, the research aims to highlight how AI chatbots contribute to long-term brand engagement.

Rapid response times enhance efficiency, while personalized interactions foster stronger emotional connections with customers. Conversational depth, including natural language processing capabilities, plays a crucial role in trust-building and brand perception. Through a mixed-method approach, this study evaluates the effectiveness of AI chatbots in improving consumer relationships and retaining loyal customers.

The findings will provide insights into optimizing AI chatbot interactions, helping businesses refine their customer service strategies. By leveraging AI to balance speed, personalization, and engagement, brands can enhance overall satisfaction and strengthen long-term loyalty.

Keywords: AI chatbots, Customer service, Response time, Conversational quality, Customer loyalty, Brand engagement.

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## | 0492 | Thinking Model for Scene Understanding in Unhealthy Environment Using AI

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#### **ABSTRACT:**

The development of Artificial Intelligence (AI) has resulted in significant advancements in scene understanding, particularly in difficult and hazardous environments. This paper proposes a groundbreaking cognitive model designed to improve scene comprehension in contexts where environmental factors such as pollution, dangerous materials, low visibility, or extreme conditions obstruct human perception and traditional computational approaches. The model integrates leading-edge machine learning algorithms, the fusion of multimodal sensor data, and adaptive algorithms capable of dynamically analysing and interpreting complex scenarios. By employing effective feature extraction, anomaly detection, and contextual reasoning, this model aims to provide actionable insights and enhance decision-making processes in unsafe environments. Potential applications include disaster response, industrial safety, and environmental monitoring. Experimental validation indicates that the model demonstrates superior accuracy, resilience, and scalability, offering a revolutionary approach to understanding and navigating unhealthy environments.

Keywords: Unhealthy Environment, Performance matrix, Sensors etc.

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## | 0033 | AI image Captioning Bot

Ashish Kumar Sonwani<sup>1</sup>, Kamal Prasad<sup>2</sup>, Deepa Gajendra<sup>3</sup>, Soniya Jaiswal<sup>4</sup>, Anshita Shrivastava<sup>5</sup>, Bhumika Shrivastava<sup>6</sup>

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### **ABSTRACT:**

With the development of deep learning, the combination of computer vision and natural language process has aroused great attention in the past few years. Image captioning is a representative of this filed, which makes the computer learn to use one or more sentences to understand the visual content of an image. The meaningful description generation process of highlevel image semantics requires not only the recognition of the object and the scene, but the ability of analyzing the state, the attributes and the relationship among these objects. Though image captioning is a complicated and difficult task, a lot of researchers have achieved significant improvements. In this paper, we mainly describe three image captioning methods using the deep neural networks: CNN-RNN based, CNN-CNN based and Reinforcement-based framework. Then we introduce the representative work of these three top methods respectively, describe the evaluation metrics and summarize the benefits and major challenges. Captions are not only for posting an image on social media, but the caption generated using ML models and Keras can be helpful for visually challenged people, it can be used in self-driving cars or in surveillance. Visually challenged people can be benefitted from the caption generation and by its speech output they will be aware of their surroundings. The developed project is based on a supervised learning model that generates a caption and converts it into an audio output using the GTTS module. Further by using the translate module, the output text can be translated to any of the supported languages. The Flickr8K dataset has been used for model training. For feature selection the Residual Neural Network's (RNN) ResNet50 is used. The results of the model can be improved by training it with the Flickr30K dataset which is considered the standard for the caption generation

Keywords: Image Captioning, Deep Learning, Computer Vision, Natural Language Processing, CNN-RNN, ResNet50, Supervised Learning, Assistive Technology.

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## | 0126 | Recent Progress of Rare-Earth Doped **Upconversion Nanoparticles Synthesis, Optimization** and Applications

Monika Gupta<sup>1#</sup>, Anil Kumar Verma<sup>1</sup>, Heera Sahu<sup>1</sup>, Vivek Dewangan<sup>1</sup>, Sampada Rishbud<sup>2</sup>, Livish Induria<sup>2</sup>

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### **ABSTRACT:**

Lanthanide-doped Upconversion nanoparticles are capable of converting near-infrared excitation (NIR) into UV and visible emissions through a multi-photon absorption process . These rare earth elements are incorporated in different host materials in their ionized (either divalent or trivalent) form. Upconversion is a nonlinear optical phenomenon, Most of the lasers, phosphors, amplifiers, etc., comprise RE elements. Surprisingly, the global applications of RE-based materials are increasing from industry applications to medica applications. UCNPs with a size less than or equal to 100nm consist of a host and an optically active center where dopants (e.g. RE ions) act as the optical center. Despite promising results achieved from luminescent materials such as organic dyes and quantum dots, their weak photostability and broad absorption and emission bands with moderate quantum yield restrict their various practical applications This distinctive feature has attracted considerable attention in both fundamental research and advanced optoelectronics. Due to their excellent physiochemical properties such as deep penetration depth, little damage to samples, and high chemical stability, (UCNPs) are extensively applied in bioimaging, biosensing, theragnostic, and photochemical reactions. UCNPbased biosensors demonstrate high specificity and sensitivity in detecting cancer.

Keywords: Upconversion (Ucnps); Near-Infrared Excitation (NIR); Biosensor; Bioimaging; Optoelectronics; Rare earth (RE).

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## | 0168 | Applications of Graph Theory in Social Network Analysis

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### **ABSTRACT:**

Graph theory, a fundamental area of discrete mathematics, provides powerful tools for 220aizan220220g and analyzing complex relationships in social networks. By representing individuals as nodes and their interactions as edges, graph-based models offer a structured framework to study the dynamics and structure of social syste This paper explores key applications of graph theory in social network analysis (SNA), including the identification of influential individuals through centrality measures, detection of tightly-knit communities via clustering and modularity algorithms, and the evaluation of network robustness and connectivity. Furthermore, concepts such as shortest paths, cliques, and network flows are utilized to understand information diffusion, group behavior, and the resilience of networks under stress. Advanced graph-theoretical techniques also aid in uncovering hidden patterns, predicting future interactions, and enhancing strategies for marketing, security, and public policy. The interdisciplinary integration of graph theory with computational tools and big data analytics has significantly expanded the scope and precision of SNA, enabling more accurate insights into human behavior and societal trends. This abstract highlights the pivotal role of graph theory in transforming social network data into actionable knowledge.

Keywords: Graph Theory; Nodes; Edges; Social Network; Connections; Communities.

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## |0174| Advances in Metal Detection in Water: Techniques, Challenges, and Applications

Asha Verma<sup>1#</sup> Sangeeta Patil<sup>1</sup>, Shubham Pandey<sup>1</sup>, Dinesh Kumar<sup>1</sup>, Abha Sinha<sup>1</sup>, Shruti Wasnik<sup>2</sup>

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### **ABSTRACT:**

Heavy metal contamination in water, particularly from elements such as lead (Pb), mercury (Hg), cadmium (Cd), and arsenic (As), presents a significant environmental and public health concern due to their high toxicity, persistence, and bioaccumulative nature. These metals are non-biodegradable and tend to accumulate in aquatic organisms, eventually entering the human food chain and causing adverse health effects including neurological damage, developmental issues, organ failure, and even cancer. Early and accurate detection of these contaminants is critical to ensure safe drinking water and prevent long-term ecological damage. Traditional analytical techniques such as Atomic Absorption Spectroscopy (AAS) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS) are widely recognized for their high sensitivity and accuracy. However, their high operational costs, dependence on sophisticated instrumentation, and requirement for laboratory settings limit their widespread field application, especially in resource-limited areas. Electrochemical methods, particularly Anodic Stripping Voltammetry (ASV), have emerged as cost-effective and portable alternatives, offering real-time and on-site monitoring capabilities with satisfactory sensitivity. Recent advancements in sensor technology have led to the development of biosensors that utilize biological recognition elements such as enzymes, antibodies, and DNA aptamers to achieve selective detection of specific heavy metals. Moreover, the integration of nanomaterials like gold nanoparticles, carbon nanotubes, and graphene oxide has greatly enhanced the sensitivity, response time, and miniaturization of these sensors. These innovations have contributed to the emergence of highly efficient, user-friendly, and field-deployable devices for environmental monitoring. Thus, modern detection techniques are increasingly playing a vital role in safeguarding water quality and public health.

Keywords: Water contamination; Environmental pollution; Public health; Inductively Coupled Plasma Mass Spectrometry (ICP-MS); Electrochemical detection; Anodic Stripping *Voltammetry (ASV)*:

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## |0179| Comparative Analysis of Electron Transport Layers and Hole Transport Layers for Pb-Based and Pb-Free Perovskite Solar Cells Using SCAPS-1D

Heera Ram<sup>1,2#</sup>, Rama Shankar Singh<sup>3</sup>, Anil Kumar Verma<sup>2</sup>, Monika Gupta<sup>2</sup>, Vivek Dewangan<sup>2</sup>, Dinesh Kumar Chelike<sup>4</sup>

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### **ABSTRACT:**

The performance of perovskite solar cells (PSCs) is critically influenced by the choice of electron transport layers (ETLs) and hole transport layers (HTLs), particularly when transitioning from traditional lead (Pb)-based to environmentally friendly Pb-free absorber materials. This study presents a comprehensive comparative analysis of ETLs and HTLs for both Pb-based and Pb-free PSCs using the Solar Cell Capacitance Simulator (SCAPS-1D). Multiple configurations were simulated to evaluate the effects of different ETL and HTL materials on key performance metrics such as power conversion efficiency (PCE), open-circuit voltage (Voc), short-circuit current density (Jsc), and fill factor (FF). For Pbfree/Pb-based cells, MAPb-free/PbI<sub>3</sub> was used as the absorber, while Sn-based and Bibased compounds were evaluated as Pb-free alternatives. Results indicate that the optimal combinations of transport layers vary significantly between Pb-based and Pb-free architectures due to differences in band alignment, defect densities, and interfacial properties. Notably, certain ETL/HTL combinations enhanced the efficiency of Pb-free PSCs to levels comparable to or approaching that of their Pb-based counterparts. This analysis underscores the importance of transport layer selection in advancing highperformance, lead-free perovskite photovoltaics.

Keywords: Perovskite Solar Cells; Electron Transport Layer (ETL); Hole Transport Layer (HTL); Pb/Pb-Free Perovskites; SCAPS-1D Simulation; Power Conversion Efficiency

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## | 0180 | Metal-Organic Frameworks (MOFs) for Oil Removal and Separation: A Comprehensive Research **Analysis**

Shubham Pandey<sup>1</sup>, Dinesh Kumar Chelike<sup>1#</sup>, Surbhi Sahu<sup>2</sup>, Asha Verma<sup>1</sup>, Sangeeta Patil<sup>1</sup>, Abha Sinha<sup>1</sup>

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### **ABSTRACT:**

Oil contamination in water bodies resulting from industrial discharge, spills, and petrochemical activities presents considerable environmental and public health challenges. Traditional remediation techniques such as mechanical skimming, chemical dispersants, and biological treatments frequently demonstrate inefficiencies, lack of selectivity, and unsustainable practices. Metal-organic frameworks (MOFs) have surfaced as highly promising options for oil-water separation, attributed to their significant surface area, adjustable porosity, and tailored surface chemistry. This study investigates metal-organic frameworks for oil removal applications, focusing on synthesis techniques such as solvothermal, microwave-assisted, and environmentally friendly methods. The emphasis is on functionalized MOFs that create superhydrophobic surfaces and high-efficiency composite membranes for the separation of oil-in-water emulsions. This paper examines the practical incorporation of MOFs into various materials such as sponges, membranes, meshes, and fabrics, with an emphasis on separation efficiency, reusability, scalability, and environmental safety. Significant obstacles encompass elevated production expenses, prolonged durability, and alignment with environmental standards.

Keywords: Metal-Organic Frameworks, Oil-Water Separation, Oil Spill Remediation, Porous Materials, Environmental Cleanup, Adsorption, Surface Modification.

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## | 0188 | Biocatalyst Engineering for Sustainable Biofuels

Teeka Ram Sahu<sup>1,2#</sup>, Vijayalakshmi Ghosh<sup>1</sup>, Swati Rajput<sup>1</sup>, Aachal Lonhare<sup>1,2</sup>, Manjusha Tamrakar<sup>1</sup>, Gauri Kumbhare<sup>1</sup>

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### **ABSTRACT:**

The mounting international energy imperatives, catalysed by fossil feedstock dependence, catalyse an unprecedented environmental emergency characterized by resource depletion and climate change. Given that the world's primary energy demand is expected to increase dramatically by 2050, the deep carbon intensity of traditional fuels and market unpredictability necessitate the provision of sustainable substitutes. Biofuels from plentiful biomass feedstocks are a central sustainable energy vector. Unlike traditional thermochemical processes or first-generation biofuel methods, which tend to rely on severe chemical regimes or food-feed competition, biocatalyst engineering provides a targeted, ecologically friendly solution. This cutting-edge strategy targets the redesign of naturally specifically lignocellulolytic occurring enzvmes enzymes (such as cellulases) for effective biomass breakdown and lipases for transesterification in the production of biodiesel. By employing cutting-edge strategies such as directed evolution, rational protein design. and immobilization of enzymes, these biocatalysts are engineered to enjoy enhanced catalytic activity, improved process stability under industrial conditions (such as high temperature, presence of inhibitory substances), and expanded substrate promiscuity. Reduced processing expenses, enhanced biofuel yields and titers, and less environmental impact are among the benefits. Notwithstanding advancements, obstacles still exist in reaching ultra-low enzyme prices and getting past biomass recalcitrance on an industrial scale. In order to promote a really sustainable and profitable biofuel sector, future prospects entail utilising omics technologies along with artificial intelligence/machine learning to expedite the discovery and custom optimisation of next-generation biocatalysts.

**KEYWORDS:** Biofuels; Biocatalyst Engineering; Biomass Bioconversion; Sustainability; Enzyme Optimization

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## | 0190 | Nanoparticle-Enhanced Bioremediation of **Agro-Wastewater- A Review**

Swati Rajput<sup>1#</sup>, Aachal Lonhare<sup>1,2</sup>, Vijayalakshmi Ghosh<sup>1</sup>, Teeka Ram Sahu<sup>1,2</sup>, Prabhbarani Sikdar<sup>1</sup>, Asha Manikpuri<sup>1</sup>

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### **ABSTRACT:**

Since agricultural wastewater may contain high concentrations of pesticides, fertilizers, heavy metals, and organic pollutants, it would probably be an environmental issue. These contaminants are normally hard to eliminate entirely using traditional treatment processes when present in trace concentrations. Nanoparticle-mediated bioremediation is a novel and promising treatment for enhancing the treatment efficiency and selectivity of agricultural wastewater. This approach utilizes the unique physicochemical properties of nanoparticles, i.e., reactivity, surface area, and susceptibility to functionalisation, to interact with and degrade pollutants in a manner that enhances biological activity. Pesticide residues sequestered along with agricultural runoff could be broken down and reclaimed more efficiently by adding engineered nanoparticles—i.e., metal-based (i.e., TiO<sub>2</sub>, ZnO, Fe<sub>3</sub>O<sub>4</sub>) and carbon-based (i.e., carbon nanotubes, graphene oxide) nanomaterials—into microbial cultures. Nanoparticles increase the bioavailability of the pollutants and enhance microbial efficiency by acting as adsorbents, catalysts, or carriers for microbial immobilization. Besides, the low-toxicity and biocompatibility-enhanced alternatives provided by biogenic nanoparticles synthesized from green chemistry methods are also provided. The paper discusses production of nanoparticles, degradation of pollutants, interaction of microorganisms with nanomaterials, persistence in the environment, toxicity of nanoparticles, and regulation, and possibilities for sustainable wastewater treatment in agriculture.

Keywords: Bioremediation; Nanoparticle; Organic Pollutants; Physiochemical Property

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## | 0197 | Applications of double-controlled graphical partial metric spaces to integral equations

Reshma KP<sup>#</sup>, Shubhra Sharma, Leena D. Khadse, Mohammed Faizan Ahmed, Manju Sanghi, Pankaj Sarde

Department of Mathematics, Rungta College of Engineering and Technology, Bhilai, India

### **ABSTRACT:**

Matthews developed the idea of a partial metric p on a nonempty set X. The possibility that p(x, x) is not zero is among the most intriguing characteristics of a partial metric. Additionally, a T<sub>0</sub> topology on a nonempty set X is generated for every partial metric p on X. Heckmann defined the weak partial metric space by eliminating the small self-distance postulate of partial metric. Shukla introduced the concept of partial b-metric spaces as a generalization of partial metric and b-metric spaces. Controlled metric type spaces via two control functions a(x, y) and b(x, y) on the right-hand side of the triangle inequality are the next step in the extension of b-metric spaces, which was further generalised to become Double Controlled Partial Metric type Space. Jachymski gave some generalizations of the Banach Contraction Principle to mappings on a metric space endowed with a graph. Additionally, as a new generalisation of the Partial Metric Space, we provide in this study the Double-Controlled Graphical Partial Metric Spaces, which are Double Controlled Partial Metric type Spaces equipped with a graph. Here, two binary functions govern triangular inequality. A double controlled graphical partial metric space is not necessary double controlled partial metric space. We have defined double controlled graphical Reichgraph contraction (G<sub>dc</sub>RC) and established various Fixed-Point results, which are substantiated by applications and examples. Additionally, we have examined and presented Double-Controlled Graphical Weak Partial Metric Space, which is a generalisation of Double-Controlled Graphical Partial Metric Spaces. This is achieved by substituting the small self-distance axiom with the distance between any two distinct points being greater than the average of their respective self-distances.

Keywords: Partial metric space; Partial b-metric space; Double controlled graphical partial metric space; Reich contraction; Integral equations

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## | 0199 | An Initial Investigation of the Phytoconstituents of Artocarpus heterophyllus and their potential as a treatment for psoriasis

Aachal Lonhare<sup>1,2#</sup>, Vijayalakshmi Ghosh<sup>1</sup>, Seema Verma<sup>1</sup>, Teeka Ram Sahu<sup>1</sup>, Swati Rajput<sup>1</sup>, Prabha Rani Sikdar<sup>1</sup>

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### **ABSTRACT:**

Medicinal plants have been used for centuries to treat illnesses and ailments all throughout the world. These compounds have medicinal properties, and subsequent research has led to the creation of novel medications. Medicinal plants are increasingly being used to generate plant-based medicines. Artocarpus heterophyllus, which is commonly known as jackfruit is an plant belongs to the Moraceae family and is indigenous to the forests of India's Western Ghats. Artocarpus heterophyllus contains abundant flavonoids, reducing sugars, proteins, and minerals. Traditional uses include treating diarrhoea, wound healing, ulcers, and skin proble Pharmacological applications include antibacterial, antiinflammatory, anti-diabetic, and anti-fungal properties. Artocarpus heterophyllus has the following chemical constituents: polyphenols, flavonoids, fatty acids, lowering minerals, proteins, and carbohydrates. In addition to these investigations, there are still a lot of potential scientific studies that could identify its pharmacological and therapeutic properties. The present review discusses the significance of Artocarpus hetrophyllus as a valuable source for medicinally important compounds besides its edible fruit which is a store house of minerals, vitamins, antioxidants and other nutrients and it also tells about the phytochemical profile till now. The jackfruit continues to be a relatively unexplored source for a variety of biological activities, but it also creates new opportunities for innovative treatments to combat terrible illnesses.

Keywords: Artocarpus Heterophyllus; Moraceae; Phytochemistry; Flavonoids; **Wound Healing** 

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# | 0203 | Sustainable Approaches to Agro-Waste Recycling: Pathways to Circular Agriculture

Seema Verma<sup>#</sup>, Aachal Lonhare, Vijayalakshmi Ghosh, Shabnam Nisha, Monisha Verma, Sandhya Suryavanshi

Department of Science, GD Rungta college of science and Technology, Bhilai, India-490000

#### **ABSTRACT** -

Large-scale global production of agro-waste creates opportunity for sustainable agriculture practices as well as environmental issues. In the framework of circular agriculture, this study investigates sustainable methods for recycling agricultural waste. It is feasible to improve resource efficiency and decrease waste by turning agro-waste, such as crop leftovers, food processing by-products, and animal manure, into useful goods like organic fertilizers, bioenergy, and biodegradable materials. This study explores the possible integration of important recycling technologies into agricultural systems, such as biomass conversion, anaerobic digestion, and composting. The economic, environmental, and social advantages of recycling agro-waste are also covered, with an emphasis on how it helps farmers maintain sustainable livelihoods. Along with policy frameworks and methods to promote circular agriculture, the report also discusses obstacles to widespread adoption. According to the findings, recycling agro-waste is an essential step in developing robust, sustainable agricultural systems that support international sustainability objectives.

Keywords: Agro-Waste Recycling; Circular Agriculture; Sustainable Agriculture; Biomass Conversion; Resource Efficiency

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## | 0212 | Photoluminescent Analysis Of Neodymium Doped Calcium Zirconate (Cazro3:Nd3+) Phosphor

Monisha Verma<sup>#</sup>, Shabnam Nisha, Seema Verma, Gauri Kumbhare, Sandhya, Manjusha Tamrakar

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#### **ABSTRACT:**

In this we observe the inspect the photoluminescent properties of neodymium(Nd<sup>3+</sup>)-doped calcium zirconate (CaZrO<sub>3</sub>:Nd<sup>3+</sup>) phosphor, a promising material for optoelectronic. The phosphor was synthesized by the use of solid state reaction method, ensuring high crystalline and homogeneous doping. X-ray diffraction (XRD) confirms the phase purity and structural integrity of the synthesized material. The photoluminescence (PL) spectra revealed characteristic emission peaks of Nd<sup>3+</sup>, generally within the close to-infrared (NIR) region, corresponding to the electronic transitions in the 4f energy levels of Nd<sup>3+</sup> ions. The excitation-dependent luminescence behaviour was analyzed to determine the optimal excitation wavelength for maximum emission intensity. Furthermore, the affect of Nd3+ concentration on luminescence efficiency was tested, displaying an optimal doping concentration beyond which concentration quenching effects were observed. Additionally time resolved luminescence studies provided critical insights into the excited state dynamics, elucidating the decay kinetics and energy transfer mechanisms These findings spotlight the suitability of CaZrO<sub>3</sub>:Nd<sup>3+</sup> phosphor for superior photonic packages and contribute to the improvement of efficient of the rare-earth-doped luminescent materials. The findings underscores the immense potential of CaZrO<sub>3</sub>:Nd<sup>3+</sup> as a high performance phosphor for next generation solid-state lighting, bio-imaging and photonic applications, contributing to the broader development of rare earth meterials.

Keywords: Photoluminescence; Neodymium Doping; Calcium Zirconate; Phosphor; Solid-State Synthesis; Near-Infrared Emission

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## | 0221 | Review on Design and Analysis of Off Grid Solar System for DC Load of a House.

Shabnam Nisha<sup>#</sup>, Monisha Verma, Seema Verma, Gauri Kumbhare, Sandhya Suryawanshi, Manjusha Tamrakar

Department of Science, GD Rungta college of Science and Technology, Bhilai, India-490024

#### **ABSTRACT:**

Sunlight based energy is the cleanest and most created type of environmentally friendly power. To be totally autonomous of the network source we really want to have off matrix planetary group. This proposition presents a model in which we have planned an offnetwork DC planetary group utilizing homer star. We have utilized 8 batteries, 36 PV modules to make a DC framework that would be Sufficiently adequate to furnish the necessity of home with heap of 7.81 kWh/day. We then, at that point, planned two further frameworks with DC generator, PV and Battery bank. The Homer master results for each case are expounded in the postulation. Consistent state as well as powerful framework displaying is incorporated which are finished on the MATLAB. We have planned MPPT(maximum power point tracker is an electronic DC to DC converter that improves the match between sthe sunlight based cluster (PV boards), and the battery bank or utility network) for catching greatest power. Alongside plan and displaying, the well being measures are additionally given. The well being gadget, working standard and the strategy to utilize them is moreover talked about in the proposal. Introduced results will assist with advancing in the plan of little scaled off matrix nearby planet groups that would be adequate to give the power in the far off region and on the limited scale. This examination additionally will help in planning the planetary group for the DC load.

Keywords: Off-Grid Solar System; DC Load; Solar Power Design; Energy Storage System

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## | 0225 | Zoonotic Disease: The Role of Animals in **Human Epidemics**

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#### **ABSTRACT:**

Zoonosis are infections disease. It gets transmitted between animals and humans that impose threat to public health. Zoonosis are big challenge for public health because diseases like rabies, bird fly, Covid-19 etc. gets transmitted from animals. Some diseases that are caused by germs like bacteria, parasite and fungi. It can spread through touching animal, eating food from them, vectors or environmental exposure. Human activities like deforestation, human animal interaction and urbanization may increase the risk of disease crossover. Another factor that influence zoonotic disease are climate, temperature, rainfall, movement and population of host and vectors. This abstract talks about how diseases get spread through animals to humans. It focuses on taking care of animal, human and environment together. Increasing human interference in nature are effecting our environment. By understanding how diseases gets spread through animals to human, it will help us to stop and prevent from diseases. Moreover, teaching locals, keeping surrounding clean, taking care of natural habitat and wildlife, working together in health field can help to protect communities and making the chances rarer for the risk of diseases.

Keywords: Deforestation; Communities; Urbanisation; Environmental Exposure; **Infectious** 

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## | 0236 | Mathematics and the Role of AI: Foundations, Tools, and Future Possibilities

Mohammed Faizan Ahmed<sup>1</sup>, Manju Sanghi<sup>2</sup>, Pankaj Sarde<sup>3</sup>, Reshma K P<sup>4</sup>, Shubhra Sharma<sup>5</sup>, Leena D. Khadse<sup>6</sup>

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#### **ABSTRACT:**

Mathematics is the rigorous science of patterns, structures, quantities, and logical reasoning, forming the backbone of scientific inquiry and technological advancement. The foundation of mathematics delves into the philosophical and logical underpinnings of mathematical truth, encompassing areas such as set theory, logic, number theory, and formal syste As the digital age accelerates, the integration of Artificial Intelligence (AI) into mathematics marks a transformative shift, not only in solving traditional problems but also in exploring new frontiers of mathematical discovery. We explore the multifaceted nature of mathematics, from its foundational principles to the transformative impact of artificial intelligence (AI). The integration of artificial intelligence (AI) into mathematics has revolutionized research, problem-solving, and education by automating complex computations, generating conjectures, and verifying proofs. A significant focus is placed on the current and emerging applications of AI in diverse mathematical domains, encompassing symbolic computation, theorem proving, optimization, and data analysis.

The discussion also highlights various tools from traditional equation editors to advanced AI-powered platforms that facilitate mathematical exploration and communication. Finally, the paper envisions the profound future possibilities of AI in mathematics, foreseeing accelerated discovery, enhanced understanding, and the potential for new paradigms in mathematical research and education.

Keywords: Mathematics, Foundation, Artificial Intelligence (AI), Automating, Tools, Advancement, Education, Research, Challenges, Future Possibilities.

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## | 0252 | Anisotropic Bianchi type III cosmological Models with Modified generalized Chaplygin gas and dynamical gravitational and cosmological constant

Leena.D. Khadse<sup>1,2 #</sup>, Mohammed Faizan Ahemed<sup>2</sup>, Manju Sanghi<sup>2</sup>, Pankaj Sarde<sup>2</sup>, Reshma K P<sup>2</sup>, Shubhra Sharma<sup>2</sup>

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#### **ABSTRACT:**

This paper focuses on the investigation of the Modified Generalized Chaplygin gas model that incorporates dynamical gravitational and cosmological constants. A new set of exact solutions of Einstein filed equations have been obtained for Bianchi Type III space time geometry. The paper's first section is focused on study the Modified generalized Chaplygin gas model. The paper's second part addresses cosmological models that have variable gravitational and cosmological constants. The new cosmological models approach to isotropy with evolution of the universe. It has been observed that cosmological parameters obtain for this model validate present observation.

Keywords: Bianchi Type III; Bulk Viscosity; Cosmological Constant; Gravitational Constant; Modified Generalized Chaplygin Gas.

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## | 0255 | Applications of Matrices in Real Life

Shubhra Sharma<sup>1#</sup>, Leena D Khadse<sup>1</sup>, Mohammed Faizan Ahmed<sup>1</sup>, Manju Sanghi<sup>1</sup>, Pankaj Sarde<sup>1</sup>, Reshma K. P<sup>1</sup>, K. J. Satao<sup>2</sup>

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#### **ABSTRACT:**

Many people learn Mathematics from K.G. to P.G. and even to a doctorate and a post doctorate level. But a majority of them do not know exactly where and how the concepts they have learnt are utilised in real life or what is the utility of the concepts in the real life. For example people learn  $\tan(\theta) = (\text{Opposite Side}) / (\text{Adjacent Side})$  or  $\tan(\theta) = \sin(\theta) / \cos(\theta)$ , but many do not know exactly where and how this concept is used in real life. Mathematics is a very vast subject. In fact, while various subjects contribute to the foundation of engineering, mathematics is often considered the base. The oldest subjects learnt in the world are Mathematics and Languages. It is difficult to deal with the real life applications of entire Mathematics as a whole in in a limited coverage of a paper. So we have considered a portion of Mathematics called Matrices and explored its applications in real life in this paper.

Keywords: Matrix Theory; Matrix Applications; Linear Algebra; Educational Gap in Mathematics; Matrices in Real Life

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## | 0276 | CFTR (Cystic Fibrosis Transmembrane **Conductance Regulator) Modulator Based Treatment** of Cystic Fibrosis- A Review

Manjusha Tamrakar<sup>#</sup>, Gauri Kumbhare, Teeka Ram Sahu, Monisha Verma, Shabnam Nisha, Sandhya Suryawanshi

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#### **ABSTRACT:**

Cystic Fibrosis (CF) is an inherited disorder that predominantly affects the respiratory and gastrointestinal tracts, resulting from a mutation in the CFTR (Cystic Fibrosis Transmembrane Conductance Regulator) gene. This results in the secretion of abnormally thick mucus which clogs airways, captures bacteria, and causes recurrent lung infections and progressive pulmonary damage. It also negatively impacts the pancreas, liver, intestines, and other organs. New developments in CF research bring great promise for improved treatments. Particularly, in December 2024, the U.S. FDA authorized Alyftrek (vanzacaftor/tezacaftor/deutivacaftor), a once-daily CFTR modulator. Alyftrek is a good option for patients 6 years and older with the F508del mutation and 31 other rare CFTR mutations, which were not previously treated. Alyftrek offers a valuable alternative for the intolerant to Trikafta, the current gold standard. Alyftrek is the first one including triplecombination therapy for persons with at least one responsive CFTR mutation, including the rare ones mentioned above. Clinical evidence showed its non-inferiority to Trikafta for enhancing lung function (pFEV<sub>1</sub>) as well as greater efficacy in decreasing sweat chloride levels, an important measure of CFTR activity. This approval is a considerable milestone in CF treatment, providing more convenient dosing and wider mutation coverage. Alyftrek is now in the U.S., authorized in the UK, and under review by regulators around the world. For those patients with previously unresponsive rare CFTR mutations, Alyftrek offers an important new therapy, potentially offering better outcomes for more patients.

Keywords: Cystic Fibrosis, CFTR, Modulator Therapy, Rare Mutations.

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# | 0279 | Phytosociological Assessment of some Medicinal Plant of Forest Area in Balod District, C.G.

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#### **ABSTRACT:**

Phytosociology is the study of association and interaction of plant species with each other and with environment. The phytosociological study is used in plant science to evaluate floristic composition in a given location in response to some environmental variation. Balod district is situated at the bank of Tandula River in Chhattisgarh state. It is found in 1 January 2012 from its mother district Durg. Balod has 73.4 kha of natural forest, comprising 27% of its land area. In 2020, the district had a total of 73.4kha of natural forest and 925 ha of non natural tree cover. Global Forest Watch reports Balod lost 9 ha of natural forest in 2023, which is equivalent to 2.35 kt of CO<sub>2</sub>. This study aims to study the some medicinal flora of the forest area of Balod district. Present study was carried out in forest area of Balod district. Data was collected using random sampling technique by plotting 20 m x 20 m of plots at the interval of 100 mts. Diversity of plant species of trees, shrubs and herbs was calculated by studying density, frequency and abundance. Total 87 plant species belonging to 52 genera and 28 families were reported. The most diverse family was Leguminaceae.

**Keywords:** Forest; Flora; Medicinal; Diversity

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## | 0284 | Nirgundi: A Comprehensive Guide to Its **Medicinal Benefits**

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#### **ABSTRACT:**

Vitex negundo, commonly known as Nirgundi, is a medicinal herb that thrives in the tropical and subtropical regions of Asia. This herb has a long history of use in traditional medical systems such as Ayurveda, Unani, and Siddha, and is celebrated for its numerous pharmacological advantages. Research into its phytochemical composition has identified a variety of bioactive compounds in Nirgundi, including flavonoids, terpenoids, alkaloids, and phenolic acids. These compounds contribute to its reputed therapeutic effects, which encompass anti-inflammatory, analgesic, antimicrobial, antioxidant, antidiabetic, hepatoprotective, neuroprotective, and anticancer properties. Additionally, Nirgundi is recognized for its potential to affect hormonal functions, making it useful in addressing menstrual irregularities and alleviating menopausal sympto Both clinical studies and traditional usage suggest that Nirgundi can effectively manage conditions such as arthritis, asthma, bronchitis, headaches, and various skin disorders. Its applications also include promoting wound healing, alleviating pain, and acting as a rejuvenating tonic. Despite its widespread use, safety evaluations indicate that Nirgundi is generally well-tolerated; however, high doses may lead to mild toxicity, particularly affecting the liver and kidneys. Therefore, it is recommended to use Nirgundi under the supervision of a qualified healthcare professional, especially for therapeutic purposes.

Keywords: Tropical; Pharmacological; Flavonoids; Menopausal; Toxicity

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## | 0285 | Reflection and Transmission of Seismic Waves in Thermoelastic-Anisotropic Media: A Hybrid Analytical and AI Approach

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#### **ABSTRACT:**

Understanding wave propagation through complex geological media is critical for advancing modern seismology. This study investigates the reflection and transmission of plane seismic waves through a finite thermoelastic layer situated between two monoclinic elastic half-spaces, simulating realistic subsurface conditions such as anisotropic crystalline rocks with thermal gradients. The formulation is based on generalized thermoelasticity, incorporating dual-phase-lag heat conduction to capture delayed thermal response effects common in geothermal and tectonic settings. Analytical solutions are derived for wave amplitudes and phase velocities, considering full thermo-mechanical coupling and anisotropic elasticity.

To enhance the interpretability and application of these models in real-world seismic data analysis, artificial intelligence (AI) tools are integrated for parameter inversion and pattern recognition. Machine learning algorithms are trained on synthetic datasets generated from the model to identify wave modes, estimate subsurface properties, and classify reflection signatures. Results show that AI-assisted analysis significantly improves the efficiency and accuracy of seismic interpretation, particularly in detecting anisotropic boundaries and hidden thermoelastic layers. This hybrid approach bridges theoretical seismology with AI-driven geophysical exploration, offering a robust framework for imaging the Earth's interior under complex thermal and structural conditions.

Keywords: Seismic Wave Propagation; Thermoelasticity; Monoclinic Anisotropic Media; Reflection and Transmission Coefficients; Dual-Phase-Lag Model; Layered Earth Structure; AI in Seismology and Machine Learning in Geophysics

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## | 0290 | Synthesis, Characterization, and Antibacterial Evaluation of Co(II) and Ni(II) Complexes with a **Tridentate Schiff Base Ligand**

Abha Sinha<sup>#</sup>, Sangeeta Patil, Dinesh Kumar, Asha Verma, Shubham Pandey, Priyanka Singh

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#### **ABSTRACT:**

In this study, a series of Co(II) and Ni(II) complexes with a novel Schiff base ligand, 1,6dimercapto 1,6-diamino-2,4,5-triaza-3-phenyl-3-hexene, were synthesized and thoroughly characterized. The ligand acts as a neutral tridentate chelating agent, coordinating through nitrogen and sulfur donor atoms to form stable complexes with the general formula  $[ML_2]X_2$ , where M = Co(II) or Ni(II) and  $X = Cl^-$ ,  $Br^-$ , or  $NO_3^-$ . Comprehensive characterization was performed using elemental analysis, molar conductivity, magnetic susceptibility measurements, and various spectroscopic techniques including UV-Vis, IR, and N Spectral data and magnetic studies confirmed an octahedral geometry around the metal centres. Molar conductivity values suggest that all complexes behave as electrolytes in solution. Thermal analysis (TGA/DTA) provided insights into the stability and decomposition patterns of the complexes. The antibacterial activity of the free ligand and its metal complexes was assessed against selected bacterial strains. The metal complexes demonstrated enhanced antibacterial properties compared to the free ligand, indicating that complexation significantly improves biological efficacy. These findings highlight the potential of such Schiff base metal complexes in the development of new antimicrobial agents.

Keywords: Schiff Base Ligand; Transition Metal Complexes; Cobalt(II) Complexes; Nickel(II) Complexes; Octahedral Geometry; Spectroscopic Characterization; Thermal Analysis; Antibacterial Activity; Tridentate Chelation

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# | 0300 | Understanding the Role of Probability in AI Predictions

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#### **ABSTRACT:**

Artificial Intelligence (AI) systems are increasingly deployed in real-world applications where uncertainty is a core challenge. Probability plays a central role in enabling AI models to make informed predictions despite incomplete or ambiguous data. This paper explores the mathematical foundations and practical applications of probability in AI, with a focus on probabilistic reasoning, prediction, and decision-making. Key concepts such as conditional probability, Bayes' theorem, and probability distributions are examined in the context of AI models like Naive Bayes classifiers, probabilistic graphical models, and Bayesian networks. The study also highlights how probability is used to model uncertainty in supervised and unsupervised learning, particularly in scenarios like spam detection, recommendation systems, and medical diagnosis. Additionally, the paper discusses how probabilistic outputs allow AI systems to express confidence levels in predictions, enhancing their transparency and reliability. By providing a clear understanding of these mathematical tools, the research emphasizes the importance of probability as a foundational element in building AI systems that are not only accurate but also interpretable and robust in uncertain environments. This understanding is crucial for developing AI solutions that align with real-world complexity and human expectations.

Keywords: Artificial Intelligence (AI); Machine Learning; Probability Theory; Uncertainty Modeling; Probabilistic Reasoning; Bayes' Theorem; Conditional Probability; Probability Distributions; Bayesian Networks; Probabilistic Graphical Models; Prediction Confidence.

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## | 0315 | Silent Interactions: The Environmental Significance of Parasitic Plants in Natural and **Agricultural Ecosystems**

28 - 29 June 2025

Sweta Gaikwad<sup>1#</sup>, Vandana Mishra<sup>1</sup>, Seema Verma<sup>2</sup>

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#### **ABSTRACT:**

Parasitic plants, though often overlooked, play a crucial role in shaping the structure and function of natural and agricultural ecosyste In natural ecosystems, parasitic plants contribute to maintaining species diversity by regulating dominant plant populations and facilitating niche differentiation. Conversely, in agricultural settings, their presence often translates to reduced crop yield, economic losses, and challenges in pest management. This study explores the ecological and environmental significance of parasitic plant species, examining their interactions with host plants, effects on biodiversity, and influence on ecosystem processes such as nutrient cycling and plant community dynamics. A comprehensive understanding of their roles is critical for developing sustainable strategies that balance ecological conservation with agricultural productivity. This study explores the dualistic nature of parasitic plants—highlighting their ecological benefits as keystone species and their detrimental impacts as aggressive weeds. Additionally, it discusses their potential as bioindicators of ecosystem health and the emerging insights into their biochemical interactions. Key findings of the study reveal that parasitic plants contribute to maintaining species diversity in natural ecosystems by suppressing dominant host species, thereby facilitating coexistence among subordinate species. In agricultural systems, however, they often reduce crop yields and exacerbate food security concerns, particularly in low-resource regions. Some parasitic species enhance soil nutrient availability and support beneficial microbial communities. It concludes that parasitic plants should be recognized not only as pests but also as integral components of ecological networks with both harmful and beneficial effects. Understanding these silent interactions can inform sustainable land management and conservation strategies that balance agricultural productivity with ecological integrity.

Keywords: Parasitic plants; ecosystem dynamics; biodiversity; agricultural systems; nutrient cycling.

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## | 0317 | Determining Genes of Hepatocellular Carcinoma Using Crispr-Cas9

28 – 29 June 2025

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#### **ABSTRACT:**

The clustered regularly interspaced short palindromic repeats (CRISPR)-associated protein 9 (Cas9) system is a groundbreaking gene-editing technology that originated from prokaryotic immune defense mechanis This system has revolutionized the fields of genetic engineering and biomedical research due to its precision, efficiency, and adaptability. CRISPR-Cas9 enables both in vitro and in vivo gene screening, facilitating the identification and functional characterization of genes involved in various diseases, including hepatocellular carcinoma (HCC). HCC remains a leading cause of cancer-related mortality worldwide, and understanding its genetic underpinnings is crucial for developing effective therapies. Over the past decade, significant efforts have been made to enhance the CRISPR-Cas9 system through strategies such as optimizing guide RNA (gRNA) efficiency, modifying Cas9 nucleases for improved specificity, and reducing off-target effects. These advancements have expanded its potential for clinical applications. This abstract provides a concise overview of previous CRISPR-Cas9-based screening studies focused on HCC carcinogenesis. It highlights the system's transformative role in uncovering tumorigenic pathways and potential therapeutic targets. Furthermore, it addresses existing challenges and outlines future directions for integrating CRISPR-Cas9 in multi-targeted, cocktail-style therapies to improve outcomes in HCC treatment.

Keywords: CRISPR-Cas9; Gene editing; Hepatocellular carcinoma; gRNA optimization; Cancer screening; Molecular therapy.

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## | 0321 | A Review of Matrix Inversion Applications in **Mathematics and Engineering**

Khushi Kumari<sup>1#</sup>, Shubhra Sharma<sup>1</sup>, Shishir Vind Sharma<sup>2</sup>, Mahak Shrivastava<sup>1</sup>, Kishan Jha<sup>1</sup>, Gauri kumari Mahato<sup>1</sup>

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#### **ABSTRACT:**

The inverse of a matrix is a fundamental concept in linear algebra, similar to the reciprocal of a number in arithmetic. It plays a key role in solving systems of linear equations using matrix methods. This paper explores the definition of a matrix inverse, methods for finding it—such as the adjoint method and row reduction—and the conditions required for a matrix to be invertible. It also discusses real-world applications of inverse matrices in fields like computer science, engineering, and cryptography. The aim is to present the concept clearly and demonstrate its practical value in solving real-life proble In mathematics, matrix inversion is used in areas like linear algebra, numerical analysis, and optimization. For example, when solving equations of the form Ax = B, finding the inverse of matrix A allows for a direct solution using  $x = A^{-1}B$ . Though in practice, direct inversion is not always used due to computational complexity, the concept is key to understanding many numerical methods. In engineering, matrix inversion has many real-world uses. In electrical engineering, it helps analyse complex circuits by solving network equations. In mechanical and civil engineering, it is used in structural analysis to study stress and deformation in materials. Control systems engineering also relies on it for system modelling and stability analysis. In summary, matrix inversion is a fundamental concept that bridges mathematical theory and practical engineering solutions, helping solve problems efficiently in various technical fields.

Keywords: Matrix Inversion; Linear Algebra; Invertible Matrices; Adjoint Method; Engineering Application; Numerical Analysis.

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# | 0324 | Mathematical Foundations of Fairness Metrics in Artificial Intelligence

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#### **ABSTRACT:**

Now a days AI systems increasingly influence decisions in areas such as hiring, lending, law enforcement, and healthcare, the demand for fairness and ethical responsibility in algorithmic outcomes has become critical. This abstract explores the mathematical foundations of fairness metrics—quantitative tools used to measure and mitigate bias in machine learning algorith Several core metrics are analysed, including demographic parity, equalized odds, predictive parity, and individual fairness. Each metric relies on probability theory, statistical inference, and optimization techniques to assess whether an algorithm treats different groups equitably. However, fairness metrics often conflict with one another, leading to trade-offs that must be carefully considered. This paper investigates the mathematical definitions, advantages, and limitations of common fairness metrics, and discusses how these tools guide the development of fairer AI syste Emphasizing a balance between technical precision and ethical impact, we highlight the need for interdisciplinary strategies that align mathematical rigor with social values.

Keywords: Fairness Metric; Algorithmic Bias; Machine Learning Ethics Demographic Parity Equalized Odd; Predictive Parity Individual Fairness; Mathematical Foundations Statistical Inference; Optimization Techniques

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## | 0328 | A Review on Tridiagonal Matrix

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#### **ABSTRACT:**

Tridiagonal matrices are a special type of square matrix where the non-zero elements appear only on the main diagonal and the diagonals directly above and below it. These matrices are very important in solving problems in numerical methods, especially those that come from differential equations and simulations. In this paper, we had explained what tridiagonal matrices are, their properties, and how they are used in solving mathematical proble This review can be helpful for students and researchers working in the field of applied mathematics and engineering. Tridiagonal matrices are commonly used in mathematics, physics, and engineering, especially in solving systems of linear equations and differential equations. They are important in numerical methods because they simplify calculations and require less computer memory and processing time compared to general matrices. One of the biggest advantages of tridiagonal matrices is that they allow for faster and easier solutions using special methods like the Thomas algorithm, which is a simplified form of Gaussian elimination. This makes them very useful in real-life problems like solving heat flow, vibrations in structures, or electrical circuit simulations. Thus, tridiagonal matrices are simple but powerful tools in mathematical problem-solving. Their structure helps reduce complexity and improve the efficiency of solving equations, which is why they are widely used in both academic and practical applications.

Keywords:-Tridiagonal Matrix; Numerical Methods; Eigenvalue Problems; Linear Equations; Diagonal Matrix; Matrix Structure.

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## | 0330 | Design and Implementation of a Homomorphically Encrypted Biometric Authentication Scheme

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#### **ABSTRACT:**

In an era of increasing reliance on biometric authentication systems, protecting sensitive biometric data from exposure and misuse has become a critical challenge. Traditional encryption methods like RSA, Elgamal offer data-at-rest protection but fall short when computations are required over encrypted data. This paper presents the design and implementation of a privacy-preserving biometric authentication scheme utilizing homomorphic encryption (HE), which enables secure computation on encrypted biometric templates without ever decrypting them. We employ a lattice-based HE scheme to perform encrypted comparisons between stored templates and user-submitted biometric inputs—ensuring end-to-end confidentiality, even in untrusted environments.

The proposed system is evaluated using fingerprint and facial recognition datasets, where biometric feature vectors are encrypted and matched using homomorphic distance computations. We discuss parameter tuning, noise growth management, and optimization strategies to balance security, accuracy, and performance. Experimental results demonstrate that our scheme achieves practical authentication accuracy while maintaining strong post-quantum security guarantees. This research contributes to the advancement of secure and privacy-aware biometric authentication mechanisms, particularly relevant for cloud-based and decentralized identity syste

Keywords: Biometric Authentication; Encrypted Biometrics; Lattice-Based Cryptography; Post-Quantum Security; Secure Biometric Matching

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## | 0364 | Utilizing Topological Invariants as Hard **Problems in Public Key Cryptosystems**

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#### **ABSTRACT:**

This paper explores the feasibility of employing topological invariants as the mathematical foundation for constructing secure public key cryptosyste Traditional cryptographic systems often rely on number-theoretic problems such as integer factorization or discrete logarithms, which are increasingly vulnerable to advancements in quantum computing. This study looks at whether topological structures, like knot invariants, homology groups, and braid group representations, can provide tough problems that are good for secure asymmetric encryption. Topological invariants, which do not change when shapes are stretched or bent, are recognized for being mathematically complex and hard to simplify, making them good options for creating one-way functions. We present a conceptual design of a public key encryption scheme that utilizes these topological constructs, outlining the basic framework and key generation mechanism. A comparative security analysis is performed to assess the theoretical strength of the proposed system against both classical and quantum attacks. Furthermore, we compare the proposed approach with existing postquantum cryptographic schemes, highlighting its advantages and limitations in terms of key size, computational efficiency, and implementation feasibility. While this work remains in the theoretical domain, it opens up promising directions for interdisciplinary research at the intersection of algebraic topology and cryptography. Future efforts will focus on algorithmic optimization and real-world applicability of topologically based cryptographic models.

Keywords: Topological Invariants; Public Key Cryptosystems; Knot Theory; Homology Groups; Braid Groups; Algebraic Topology; Post-Quantum Cryptography; Computational Hardness; Asymmetric Encryption; Cryptographic Primitives

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# | 0369 | Phytoremediation of Sanitary Pad Waste: An Eco-Friendly Strategy for Pollutant Degradation and Waste Reduction

Asha Manikpuri<sup>1#</sup>, Kiran Tiwari<sup>1</sup>, Swati Rajput<sup>1</sup>, Prabha Rani Sikdar<sup>2</sup>, Bhupendra Kumar<sup>1</sup>, Aditya Kumar<sup>3</sup>

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#### **ABSTRACT:**

The growing environmental challenge posed by non-biodegradable content of sanitary pad waste, such as plastic-based materials and superabsorbent polymers, require critical attention. Traditional disposal methods like landfilling and incineration aggravate pollution and contribute significantly to greenhouse gas emissions, leading to speedy waste accumulation and microplastic pollution. This review explores phytoremediation as pioneering and eco-friendly biotechnological solution to this acute crisis. It reconciles existing information on its ability to degrade the biodegradable fractions of sanitary pads while simultaneously quickening the breakdown and removal of associated pollutants. This paper examines the documented potency of select plant species, notably Vetiveria zizanioides and Helianthus annuus, chosen for their established rhizodegradation (plant-assisted microbial breakdown in the root zone) and phytoextraction (plant uptake of contaminants) capacities. Their capacity to biodegrade microplastics, dyes, and other organic pollutants leaching from sanitary pad waste is examined based on existing literature. Evidence suggests that these plants greatly enhance microbial activity within the rhizosphere, hence hastening the decomposition of organic matter. This biological approach offers an ecologically benign disposal option and contributes to reducing overall waste volume by actively removing or neutralizing harmful contaminants in a natural and less impactful manner. Additional research needs are spotlighted to optimize conditions and extend the range of suitable plant species for successful larger-scale application.

Keywords: Phytoremediation; Sanitary Pad Waste; Rhizodegradation; Pollutant Removal; Phytoextraction; Superabsorbent polymers.

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## | 0370 | Recent advances and Future Development of **Optical Fibre Technologies**

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#### **ABSTRACT:**

The material qualities and processing technologies of optical fibre face significant challenges due to the expanding fields of applications for contemporary optical fibres. In addition to discussing new methods for enhanced and prolonged doping qualities in fibre fabrication, this work provides an overview of the strengths and weaknesses of well-known vapour deposition fibre preform technologies. In order to get around the limitations of traditional vapour deposition techniques with regard to the volume manufacture of rare earth (RE)-doped quartz and high silica glasses, alternative fabrication technologies are also covered. In terms of improved RE solubility, nonlinear fibre property adjustability, and the potential for hybrid fibre synthesis, the novel preform technologies complement each other. The requirements of specialty fibres, including modified preform and fibre diameters, different coating characteristics and micro-structuring of fibre configurations as low as in the nano-scale range, are the basis for the description of the drawing technology.

Keywords: Optical Fibre; Fabrication; Rare Earth; Coating

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### | 0371 | AI Approach for the Removal of Heavy Metals from Industrial Wastewater

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#### **ABSTRACT:**

Heavy metals pose a significant threat to ecosystems and human health because of their toxic properties and their ability to bioaccumulate in living organis Traditional removal methods often fall short in terms of cost, energy efficiency, and minimizing secondary pollutant generation. Clean water access is a basic human necessity, but even in current times, the use and reuse of contaminated water is observed commonly worldwide. Industrialization and development have led to an increase in urban wastewater generation, and remediating it has been one of the biggest challenges for scientists and researchers everywhere. The country's rapid urbanization has fueled the expansion of various industries to meet rising demands. While industrialization significantly boosts national income, it also poses severe risks to human health and aquatic ecosystems due to the improper disposal of industrial waste into water bodies. Untreated industrial wastewater can seriously harm the environment since it frequently contains a complex variety of harmful substances. Quantum chemical calculations (QCC) and artificial intelligence (AI) help in the removal of heavy metals from wastewater. By leveraging these methods, we aim to develop highly efficient and selective materials and processes for environmental remediation. By unravelling the underlying mechanisms, these techniques pave the way for developing more efficient and selective removal technologies. Do AI-powered search tools offer a superior alternative to conventional search methodologies for executing an exhaustive systematic review? Utilizing big-data analytics and AI tools such as Litmaps.co, Research Rabbit, and MAXQDA, this study conducts a thorough analysis of remediation techniques for soils co-contaminated with heavy metals and PAHs.

Keywords: Quantum Chemical Calculations; Heavy Metals; Artificial Intelligence

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## | 0373 | Chemical Warfare Agent and their AI Detection

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#### **ABSTRACT:**

Chemical Warfare Agents (CWAs) pose a major threat to global security due to their high toxicity, rapid action, and potential for mass casualties. Despite their effectiveness, traditional detection techniques can have drawbacks, including slow reaction times, exorbitant expenses, and a reliance on human judgement. Real-time CWA detection, identification, and classification might be improved with the use of recent developments in artificial intelligence (AI). To improve CWA detection capabilities, this article investigates the integration of AI technologies, including machine learning, deep learning, and sensor fusion approaches. We examine the efficacy of neural networks and pattern recognition algorithms in differentiating CWAs from safe substances, assess existing detection systems, and highlight recent advancements in AI-driven chemical sensing. Issues including sensor variability, false positives, and data scarcity are discussed, and solutions like adaptive learning models and synthetic data production are suggested. The study comes to the conclusion that AI-enhanced detection frameworks represent a major breakthrough in the mitigation of chemical threats, as they not only improve accuracy and speed but also allow deployment in dynamic and distant contexts.

Keywords: Chemical Warfare Agents; AI-Driven Chemical Sensing; Artificial Intelligence.

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## | 0421 | Production of Synthetic Fertilizer by Using CO<sub>2</sub> Captured Generated by Cement Industry

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#### **ABSTRACT:**

The cement industry emits massive quantities of CO<sub>2</sub> into the atmosphere due to the decomposition of CaCO<sub>3</sub> and clinker production. This anthropogenic CO<sub>2</sub> can be utilized as a feedstock for producing urea, a common fertilizer, by reacting ammonia with CO<sub>2</sub>. However, the current production process for Cement contributes to carbon emissions, exacerbating climate change and its associated consequences, such as global warming, extreme weather events, ocean acidification, and biodiversity loss. Utilizing waste CO<sub>2</sub> from cement plants to produce fertilizers like urea could offer a potential solution. By leveraging this CO<sub>2</sub> as a raw material, future production costs of fertilizers might decrease. Nevertheless, a clear roadmap for transitioning waste CO<sub>2</sub> into valuable products is still needed. This approach could help mitigate the environmental impacts of both the cement and fertilizer industries while promoting sustainable practices.

Keywords: Cement Industry; Fertilizer; Carbon Dioxide

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## | 0430 | Different Algorithms Based on PIFS for Fractal **Image Compression**

Subhash C Shrivastava<sup>1#</sup>, Amit Shrivastava<sup>2</sup>, Jagriti Sahu<sup>1</sup>, Neha Kumbhar<sup>1</sup>, Nidhi Shrivastava<sup>1</sup>, Rupali Tiwari<sup>1</sup>

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#### **ABSTRACT:**

Fractal image compression may be performed with the aid of partitioning an image into exclusive domains, and for every domain there may be a transformation into range element. The general set of rules produced for this cause is called the Partitioned Iterated Function System. The domain-range equivalence also relevant to the overall inverse problem associated with PIFS. The approach of fractal image compression via PIFS is better than the general fractal image compression method. In this paper we have done the comparative study of different fractal image coding algorithms Iterated function system based algorithm, partitioned iterated function based algorithm and genetic algorithm and conclude that the PIFS based fractal image compression is more efficient technique than IFS.

Keywords: Fractal Image Compression; Iterated Function System; Partial Iterated Function System.

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# | 0431 | Comparative Study of Optical Properties of CdS and CdZnS Thin Films

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#### **ABSTRACT:**

CdS and CdZnS thin films have been prepared on glass substrate by using Chemical Bath Deposition method. Photoluminescence and Photoconductivity properties of CdS and CdZnS are studied. Photoluminescence study has been done. Photoluminescence excitation wavelength ranges of 365 nm and emission wavelength is ranges from 400-700 nm. PL emission study has been done by varying the concentration of Cadmium and Sulfur. CdCl<sub>2</sub> is used as flux. Studies also have been done for the varying concentration of CdCl<sub>2</sub>. The influence of variation of ratio of cadmium and sulfur was studied on the PL emission intensity of (Cd-Zn) S:CdCl<sub>2</sub> thin fil Some properties related to nanocrystalline effects are also found. The influence of variation of ratio of cadmium and sulfur was studied on the PL emission intensity of (Cd-Zn) S:CdCl<sub>2</sub> thin fil In a selected ratio of cadmium and sulfur for which emission intensity was highest, the effect of impurity concentration on PL emission intensity was studied. A photoconductivity rise and decay spectra was obtained for different ratio of cadmium and zinc.

Keywords: Thin Film; Photoluminescence; Photoconductivity

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## | 0433 | Advances in the Mathematical Theory of **Iterated Function Systems for Fractal Generation**

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#### **ABSTRACT:**

Investigating new aspects of Iterated Function Systems (IFS) ability to produce detailed fractal sets, this study explores the basic mathematical theory of IFS. Affine contraction mappings in entire metric spaces are the main subject of traditional IFS theory, which results in unique compact attractors. By examining generalized IFS models, such as those that include deterministic or time-dependent parameters, changing contraction factors, and non-linear transformations, this work builds on this basis. The goal of the study is to evaluate the topological and dimensional properties (such as Hausdorff and box-counting dimensions) of the attractors produced by these extended IFS frameworks under these generalized constraints, as well as to establish new existence and uniqueness theorems for them. We also investigate how the structure and complexity of the generated attractors are affected by IFS with inverses and higher-order IFS. This study advances a deeper mathematical knowledge of self-similarity and fractal geometry by expanding the theoretical foundations of IFS. This provides up the possibility for development and investigation of a larger class of complex mathematical objects.

Keywords: Iterated Function Systems; Contraction Mapping; Metric Space; Attractor; Fractal.

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## | 0439 | Exploring the Impact of Climate Variables on Crop Yield Prediction through Advanced Statistical Correlation and Machine Learning Techniques

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#### **ABSTRACT:**

Statistical correlation analysis has been growing in importance for improving crop yield predictions as it exposes significant inter-correlations between agro-climatic variables, soil properties, and agricultural products. Correlation techniques—such as regression analysis, timeseries modeling, and spatial regression have been proposed in the literature to enhance yield prediction in various agricultural contexts, and this study surveys such progress. These analyses of data help make trend analysis as the yield vs factors like temperature, precipitation, soil pH and nutrients will help us understand the dependency and we could use these as input in generating predictive models. The incorporation of geospatial technologies such as GPS, and remote sensing improves the accuracy of such models. Machine learning algorithms like Random Forest and XGBoost, when combined with correlation-based feature selection, improve yield prediction accuracy, particularly in complex and nonlinear relationships. Multiple correlation schemes are better for spatial heterogeneity and climate variation effects. Ensemble models with correlation-aware features reduce prediction error in semi-arid areas. Integrating statistical models with process-based simulations is challenging, but correlation-driven dimensionality reduction enhances numerical calculation efficiency and accuracy. This study highlights the value of statistical correlation in precision agriculture, risk management, data-driven resource allocation, and adaptive management. Future developments include real-time satellite data inclusion, improved dynamic correlation models, and global food system resilience.

Keywords: Statistical Correlation; Crop Yield Prediction; Precision Agriculture; Regression Analysis; Machine Learning; Remote Sensing; Climate Variables; Data-Driven Agriculture.

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## | 0441 | Anti-larval Essential oil Nanodispersion for **Culex Mosquito Control**

Vijayalakshmi Ghosh<sup>#</sup>, Aachal Lonhare, Teeka Ram Sahu, Swati Rajput, Seema Verma, Prabha Rani Sikdar

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#### **ABSTRACT:**

In the present study, polymeric encapsulation of eucalyptus oil nanoemulsion was done for the controlled release of bioactive compounds. O/W nanoemulsion was prepared from eucalyptus essential oil, non-ionic surfactant polysorbate80 and water by spontaneous emulsification method. The optimized eucalyptus oil nanoemulsion was formulated with the droplet diameter of 20.4 nm and polydispersity index of 0.121. Transmission electron micrographs revealed that the nanoemulsion droplets were spherical in morphology and were in the size range of 10-100 nm. The optimized nanoemulsion was encapsulated with chitosan polymer by using glutaraldehyde as a cross-linking agent. Encapsulation of eucalyptus oil nanoemulsion was optimized for the process parameters such as chitosan concentration and nanoemulsion concentration in order to obtain applicable encapsulation with enhanced release of eugenol. The essential oil-loaded microcapsules were spherical and smooth in shape as revealed by phase contrast microscopy and scanning electron microscopy (SEM) with the diameter of 0.54±0.02 mm. Mosquito larvicidal activity of encapsulated essential oil nanoemulsion was better against malaria vectors Culex quinquefasciatus when compared to non-encapsulated nanoemulsion, due to the controlled release of the bioactive components. The results of this study will be helpful for future vector control strategies as we provided a practical combined technique of nanoemulsion formulation and polymeric encapsulation as potential delivery system of hydrophobic bioactive compounds against mosquito vector.

KEYWORDS: Eucalyptus Essential Oil; Nanoemulsion; Encapsulation; Controlled Release; Chitosan; Larvicidal Activity

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## | 0449 | A systematic study of Tensor Analysis, Computation and Applications

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#### **ABSTRACT:**

Tensor analysis has emerged as a critical mathematical tool in both theoretical and applied disciplines, offering a structured framework for representing and manipulating multidimensional data. This explores the foundational principles of tensor analysis, with a focus on its computational strategies and wide-ranging applications. The role of high-performance computing in accelerating large-scale tensor computations is also examined. From signal processing and computer vision to quantum mechanics and machine learning, tensors are instrumental in modelling complex relationships and uncovering hidden patterns in high-dimensional datasets. Through previous research studies, we demonstrate how tensor-based models enhance data representation and facilitate improved prediction and classification. Moreover, recent advances in deep learning architectures, such as tensorized neural networks, highlight the growing importance of tensor analysis in artificial intelligence. This concludes by identifying some key challenges, including computational scalability and numerical stability, and suggests directions for future research to bridge theoretical developments with practical implementations.

Keywords: Tensor Analysis; Tensor Decomposition; Multidimensional Data; Tensor Computation; CP Decomposition; Tucker Decomposition; High-Performance Computing; Machine Learning; Signal Processing; Tensor Networks.

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## | 0450 | Application of the Pathway–Type Transform to a New Form of a Fractional Kinetic Equation Involving the Generalized Bessel Maitland Function

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#### **ABSTRACT:**

Fractional calculus is a division of mathematics indicates of the generalization integration as well as differentiation to arbitrary (non-integer) order. Now a day, it is indicated by the recent research output that the dimension of fractional order calculus (FOC) is tuned into the fractional on science and engineering. It is also found that the fractional calculus describes in models and respective other physical phenomena. It is also found that the fractional calculus describes in models and respective other physical phenomena. Instead of Integer derivative fractional order differential equation have fractional derivatives. One of the important kind of fractional order differential equations is the kinetic equation. One of the important fact is that kinetic equation has received increased attention in electrodynamics, control system, economics, hydrodynamics, physics, geophysics and mathematics. A significant role as tools of mathematics that are frequently employed to describe a variety of physical and astrophysical phenomena is played by fractional -order kinetic (reaction- type) equation. In this paper, we approached to the solution on fractional  $\lambda$  - kinetic equation based on Bessel Maitland function by using Pathway type transform techniques, proposing a significant potential to be applied to solve various problem with phenomena in physics such as fractional statistical mechanics, anomalous diffusion and fractional quantum mechanics. Concluding brief discussion cases, by using MATLAB software.

Keywords: Bessel Maitland function; Pathway-type transform; Fractional kinetic equation; Bessel Maitland Function

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## | 0455 | Correlation Techniques in Agricultural Research: A Comparative Analysis of Pearson's and Spearman's Correlation Coefficients

Amit Shrivastava<sup>1#</sup>, Nidhi Shrivastava<sup>2</sup>, S.C. Shrivastava<sup>2</sup>, Neha Kumbhar<sup>3</sup>, Rupali Tiwari<sup>4</sup>, Jagriti Sahu<sup>5</sup>

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#### **ABSTRACT:**

Statistical correlation analysis has been growing in importance for improving crop yield predictions as it exposes significant inter-correlations between agro-climatic variables, soil properties, and agricultural products. Correlation techniques—such as regression analysis, timeseries modeling, and spatial regression have been proposed in the literature to enhance vield prediction in various agricultural contexts, and this study surveys such progress. These analyses of data help make trend analysis as the yield vs factors like temperature, precipitation, soil pH and nutrients will help us understand the dependency and we could use these as input in generating predictive models. The incorporation of geospatial technologies such as GPS, and remote sensing improves the accuracy of such models. Machine learning algorithms like Random Forest and XGBoost, when combined with correlation-based feature selection, improve yield prediction accuracy, particularly in complex and nonlinear relationships. Multiple correlation schemes are better for spatial heterogeneity and climate variation effects. Ensemble models with correlation-aware features reduce prediction error in semi-arid areas. Integrating statistical models with process-based simulations is challenging, but correlation-driven dimensionality reduction enhances numerical calculation efficiency and accuracy. This study highlights the value of statistical correlation in precision agriculture, risk management, data-driven resource allocation, and adaptive management. Future developments include real-time satellite data inclusion, improved dynamic correlation models, and global food system resilience.

Keywords: Statistical Correlation; Crop Yield Prediction; Precision Agriculture; Regression Analysis; Machine Learning; Remote Sensing; Climate Variables; Data-Driven Agriculture.

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## | 0456 | Geometric Properties of Certain Subclass of Harmonic Univalent Mappings Involving **Generalized Multiplier Transforms**

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#### **ABSTRACT:**

By making use of a generalized multiplier transforms, we have introduced and studied a subclass of sense preserving complex valued harmonic univalent mapping. Main focus have been given to study the classical behaviour of the newly defined class, such as inclusion properties under convolution, convex combinations, growth and covering results, and the radius of convexity. Various classical behaviour of newly defined subclasses of harmonic univalent functions are presented. Harmonic univalent mappings are the generalization to the conformal mappings. However, these mappings are not at all determined with their image domains, not likely to conformal mappings. This theory have involved the serious attention of complex analysts only after the appearance of seminal work by Clunie and Sheil-Small in 1984. We shall be particularly interested in the class of functions which are analytic in the open unit disk and normalized by certain conditions. Some multiplier operators has been defined which unifies various other operators studied in literature. We have discussed some necessary and sufficient conditions for the function to belong to the class. There is a great expectation that the harmonic Koebe function will play the extremal role in many of these problems, much like the role-played by Koebe function in the classical theory of analytic univalent functions.

Keywords: Harmonic Univalent Functions, Coefficient Estimates, Conformal Mappings, Integral Operator, Radius Of Convexity

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## | 0458 | Toxic Metal Leaching from Cooking Utensils: Health Risks, Regulatory Gaps, and Safer Alternatives

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#### **ABSTRACT:**

This study investigates the phenomenon of toxic metal leaching from cooking utensils, a critical public health concern. The migration of metals such as aluminium, lead, cadmium, nickel, and arsenic into food during cooking is influenced by various factors, including cookware composition, thermal exposure, cooking duration, and food acidity. A comprehensive analysis of commonly used cookware materials, including stainless steel, non-stick coatings, ceramics, cast iron, and aluminium, reveals distinct risk profiles for each material. Notably, non-stick coatings exhibit thermal degradation and release of toxic volatile organic compounds (VOCs), while aluminium cookware demonstrates increased leaching of aluminium ions, particularly in acidic food matrices. The toxicological risks associated with metal leaching are substantial, with chronic exposure linked to adverse health outcomes, including renal dysfunction, neurotoxicity, and developmental delays. A critical evaluation of current regulatory frameworks reveals inconsistencies and gaps in safety standards across different regions, underscoring the need for enhanced public awareness, stricter regulatory oversight, and improved manufacturing practices. This study's findings have significant implications for consumer health, industry standards, and regulatory policies. By elucidating the risks associated with toxic metal leaching and identifying safer cookware materials and manufacturing practices, this research informs evidence-based recommendations for mitigating health risks and promoting sustainable culinary tools. Ultimately, this study contributes to a broader discourse on the importance of safe and sustainable cookware, highlighting the need for continued research and policy development in this critical area of public health.

Keywords: Toxic Metal Leaching; Public Health; Metal Migration; Cookware Safety; Food Safety; Food Contact Material; Volatile Organic Compounds.

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## | 0462 | AI Crop Breeding: A Review

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#### **ABSTRACT:**

Crop breeding or plant breeding. The art of improving plants or crops quality by making an alternative change in their traits to create a new variety of desirable plant. AI crop breeding uses the artificial intelligence for the fastest way to improve the formed decision and speeding up the process of breeding on the basis of data sheet collected. The aim of improving the genomic application in breeding thus acceleration in designing desired breeding. The rise of "AI breeders" brings up growth of advanced computing and rising comprehension of biology which increases the skills of the breeders with AI's smart ability of enhancing possible breeding results. The intrinsic relationship between phenotypic & genotypic to develop high quality varieties to meet human needs diversly. This Method has been confirmed in diverse crop species, including wheat, maize, and rice, underscoring its usefulness in practical breeding program. Recently developed SoyDNGP model is another significant example of the use of deep learning for genomic prediction in crop breeding.

Keywords: Crop Breeding; Genomic; AI; Computing; Smart Material

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## | 0466 | Gold and Iron-Oxide Based Nanoparticles for the Treatment of Cardiovascular Diseases: A Review

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#### **ABSTRACT:**

As cardiovascular diseases (CVDs) are still the greatest cause of death globally, there is an increasing focus on developing disease-modifying treatments. Due to their distinct properties, gold nanoparticles (AuNPs) and iron oxide nanoparticles (IONPs) hold great promise for transforming the treatment of CVDs. This review encompasses recent advancements in the application of AuNPs and IONPs for targeted delivery, diagnostic imaging, anti-inflammatory therapy, and tissue engineering in cardiovascular medicine. Their biomedical applications are foreshadowed by their excellent biocompatibility and surface chemistry, which can be modified for therapeutic oxidative stress and inflammation modulation. IONPs offer dual functionality as both therapeutic agents and contrast agents in magnetic resonance imaging (MRI), enabling real-time monitoring of disease progression and treatment. As a result, they can enhance the nanoparticle's superparamagnetic properties. In addition, IONPs can be used to noninvasively direct drug delivery systems as well as stimulate angiogenesis and cardiac tissue regeneration. However, there are still concerns regarding the toxicity and clearance of the nanoparticles as well as uncertainty in clinical application. Efforts are being made to alter particle surfaces and add biodegradable coatings to resolve these issues. This review highlights the current and potential future & challenges of CVDs with a focus on safe and effective application of therapeutic gold and iron oxide nanoparticles at clinical settings.

Keywords: Cardiovascular Diseases; Gold; Iron-Oxide; Drug Delivery, Biocompatibility

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# | 0468 | Tree diversity of Achanakmar Forest, Bilaspur,

C.G.

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## **ABSTRACT:**

Tropical deciduous forests are extremely important for biodiversity conservation, as they support wide variety of flora and fauna. They maintain balance in ecosystem. But forest area is increasingly threatened by human activities and climate change. This Study evaluates tree diversity and population structure across forest ranges of Achanakmar area, Chhattisgarh. The Achanakmar-Amarkantak Biosphere reserve is tropical deciduous type and its forest area is about 63.19%. The biosphere reserve is very rich with high density of flora and fauna. It comprises of 1527 species of identified flora, 324 species of identified fauna and many more un-described floral and faunal taxa. A stratified random sampling approach was implemented using a 10 m × 10 m area plotting 10 plots. Tree diversity was assessed employing standardized protocols. A total of 53 tree species belonging to 34 genera and 14 families were recorded. Shorea robusta found to be the dominant tree species. The findings highlight the ecological significance of tropical deciduous forests. In parallel, the study offers a valuable scientific foundation for advancing forest management practices.

Keywords: Biosphere Reserve; Flora; Forest; Diversity

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## | 0483 | Bioinorganic Perspectives on Neurodegeneration: The Dual Role of Essential Metals in Brain Health and Disease

Sandhya<sup>#</sup>, Gauri Kumbhare , Monisha Verma, Shabnam Nisha, Seema Verma, Manjusha Tamrkar<sup>6</sup>

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ABSTRACT: Neurodegenerative diseases (NDs), including Alzheimer's disease (AD), Parkinson's disease (PD), Huntington's disease (HD), and amyotrophic lateral sclerosis (ALS) are an increasingly important health burden worldwide, and their pathologies are complicated by oxidative stress, protein misfolding, mitochondrial dysfunction, and neuronal loss. One of the most severe and less understood aspects of these disorders has been the dysregulation of the key metal ions, especially those of iron (Fe), copper (Cu), zinc (Zn), and manganese (Mn) in the central nervous system in regards to their critical roles in the initiation and subsequent development of these disorders. These metal ions are essentially involved in enzyme catalysis, synaptic transmission and antioxidant protection, but their dysregulation may cause neurotoxicity through the formation of reactive oxygen species (ROS), facilitation of protein aggregation (e.g., amyloid- out and tau), and mitochondrial perturbation. Recent discoveries emphasize the role of particular metal protein interactions in disease pathology; examples include Fe and Cu which have been demonstrated to promote amyloid- aggregation and facilitate the generation of ROS in AD or Mn exposure which is associated with mitochondrial dysfunction in PD-like syndromes. In therapy, developments are the metal-specific chelators (e.g., deferiprone, PBT2), and antioxidant compounds targeting ROS formation. Also, nanotechnology-driven systems are on the rise to enhance metal ions detection and drug delivery across the blood brain barrier. Here, the bioinorganic chemistry of metal ion homeostasis in neurodegeneration is reviewed as well as current and developing diagnostic and therapeutic strategies, presenting a thorough view of the opportunities of metal-targeted therapies in the battle against neurodegenerative diseases.

Keywords: Neurodegenerative Diseases, Metal Ion Dysregulation, Reactive Oxygen Species (ROS), Tau Aggregation, Metal Chelation Therapy, Blood-Brain Barrier (BBB), Nanoparticle Drug Delivery, Bioinorganic Chemistry, Oxidative Stress, Theranostics



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## | 0495 | Effective Removal of Azithromycin Antibiotic from Aqueous Environment Using Green Approach

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**ABSTRACT:** Among the most commonly prescribed medicines for a variety of infectious disorders, including COVID-19, is azithromycin. This medication is consistently disposed away in large quantities in hospital effluents. In this studyEffective and long-lasting treatment options are necessary because water bodies contaminated with antibiotics pose major risks to the environment and public health. This study investigates the production and application of curry neem tree (Murraya koenigii) bark for the creation of nanoparticles that will remove azithromycin, a common macrolide antibiotic, from aqueous solutions. Using a green chemistry method, the therapeutic compounds found in curry neem bark were used to create nanoparticles. In order to ascertain the morphological and structural characteristics of nanoparticles, characterisation methods such as scanning electron microscopy (SEM), X-ray diffraction (XRD), and Fourier-transform infrared spectroscopy (FTIR). To determine these nanoparticles' capacity for adsorption, a variety of factors were evaluated, including pH levels, contact times, and initial antibiotic dosages. The data indicated that azithromycin was removed with high efficiency, and adsorption isotherms and kinetic models were used to explain the underlying mechanis Curry neem bark-derived nanoparticles have the potential to be an inexpensive and environmentally friendly method of lowering antibiotic contamination in water supplies, which is how this study promotes sustainable water treatment technology.

Keywords: Water purification; Green synthesis; Curry neem tree bark; Nanoparticles; Azithromycin elimination

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TRACK 7- INTERNATIONAL
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# | 0196 | The therapeutic potential of plant flavonoids on rheumatoid arthritis

Singh, Anurima<sup>1\*</sup>, Sharma, Roshni<sup>2</sup>, Khatoon, Nousheen<sup>1</sup>, Chandrakar, Monika<sup>1</sup>, Hirwani, Meenakshi<sup>1</sup>

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#### **ABSTRACT:**

Rheumatoid arthritis (RA) is an autoimmune condition that mainly affects peripheral joints. Although immunosuppressive drugs and nonsteroidal anti-inflammatory drugs (NSAIDs) are used to treat these conditions, these drugs have severe side effects. Flavonoids are the most abundant phenolic compounds that exhibit anti-oxidant, anti-inflammatory, and immunomodulatory properties. Many bioactive flavonoids have powerful anti-inflammatory effects. However, few have reached clinical use. Dietary flavonoids have been reported to control joint inflammation and alleviate arthritis symptoms in both human RA and animal models of arthritis. There is little scientific evidence about the mechanism of actions in RA. We review the therapeutic effects of different groups of flavonoids belonging to the most common and abundant groups on RA. Herbal medicines like limbrel and capsika, among others, have potential for alleviating inflammation and pain in RA and have fewer side effects than nonsteroidal anti-inflammatory drugs.

Keywords: Rheumatoid arthritis, flavonoids, Non-steroidal anti-inflammatory drugs, anti-oxidant, animal models

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# | 0198 | A two-stage extraction model for simultaneous extraction of essential oil and phenolics from tulsi leaves: implementing a blended mode microwave hydrodiffusion and gravity (MHG) model

Chandrakar, Monika\*, Khatoon, Nousheen, Hirwani, Meenakhsi, Sharma, Roshni, Singh, Anurima

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#### **ABSTRACT:**

The work is based on implementing a blend of high, medium, and sustained low power microwave heating for the extraction of essential oil from tulsi leaves using the principle of MHG. The blended mode was implemented to target the simultaneous extraction of essential oil and non-volatile principles (phenolics) from the same biomass through a twostage process. The first stage dealt with the extraction of essential oil using an optimized MHG protocol comprising of a blend of high- (510 W) and medium-power (340 W) microwave surges of 5 min each, followed by the completion of the experiment with low power microwave (170 W). The yield of essential oil obtained from the optimized MHG protocol (50 min) was found to be 5% w/w. On the other hand, MHG with singlepower microwaving at 170 W (60 min), 340 W (40 min) and 510 W (25 min) produced yields of 1.9%, 2.9% and 1.0% w/w, respectively. Hydrodistillation (240 min) could achieve a yield of 1.9% w/w only. As per gas chromatography results, the % area of eugenol content was found to be 16.64%, slightly higher than the 15.45% obtained from hydrodistillation. The second stage was about retention capabilities of the biomass with reference to the nonvolatile components. The total phenolic content of the leftover biomass after the MHG blended mode protocol was found to be 6.1 mg GAE per g of dried extract, which was more than the control (untreated) sample that retained a phenolic content of 5.4 mg GAE per g of dried extract. However, biomass obtained after hydrodistillation showed a severe depletion of phenolic content (1.9 mg GAE per g of dried extract). Thus, MHG (blended mode) allows the extraction of essential oil in the first stage, followed by the extraction of non-volatile compounds from the same biomass in the second stage, ensuring judicious and exhaustive use of plant biomass.

Keywords: Nyctanthes arbor-tristis, rheumatoid arthritis, anti-inflammatory, phytochemicals, NF-κB, immunomodulation, cytokines

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# | 0220 | Advances in Stem Cell Applications for Alopecia: Implications for Drug Development and Delivery"

Sharma, Roshni<sup>1\*</sup>, singh, Anurima<sup>2</sup>, Chandrakar, Monika<sup>1</sup>, Singh Lodhi, Juhi<sup>1</sup>, Hirwani, Meenakshi<sup>1</sup>, Sahu, Harsha<sup>1</sup>, Khatoon, Nousheen<sup>1</sup>

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#### **ABSTRACT:**

Alopecia, a condition characterized by hair loss, affects millions of individuals worldwide impacts psychological and and significantly social well-being. pharmacological treatments, such as minoxidil and finasteride, offer limited efficacy and are often associated with adverse effects and relapse after discontinuation. Recent advancements in regenerative medicine, particularly stem cell-based therapies, have opened new avenues for treating various forms of alopecia, including androgenetic alopecia, alopecia areata, and cicatricial alopecia. This review explores the current progress in stem cell research and its applications in alopecia, with a specific focus on implications for drug development and delivery within the pharmacy field. Stem cells, including mesenchymal stem cells (MSCs), dermal papilla cells (DPCs), and induced pluripotent stem cells (iPSCs), have demonstrated the capacity to promote hair follicle regeneration through their proliferative and differentiation capabilities. Moreover, stem cell-derived exosomes and conditioned media have emerged as cell-free alternatives that retain the regenerative benefits while minimizing immunogenic risks. From a pharmaceutical stand point, the integration of stem cell technologies into alopecia therapy necessitates the development of novel drug delivery systems that ensure the stability, bioavailability, and targeted action of these biologics. Nanocarriers, hydrogels, and microneedle-based systems are being investigated to optimize the delivery of stem cell products to hair follicle niches. Additionally, tissue engineering approaches using 3D bioprinting and scaffold systems are being explored to support stem cell survival and integration into the scalp environment. This review also highlights the challenges and regulatory considerations in bringing stem cell-based therapies from bench to bedside.

Keywords: Alopecia, minoxidil, finasteride, pluripotent stem cell

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## | 0224 | The Phytochemical Wealth and Pharmacological Prospects of Carissa carandas (Karanda): A Comprehensive Review

Hirwani, Meenakshi\*, Khatoon, Nousheen, Firdous, Anjila, Chandrakar, Monika, Singh, Anurima, Sharma, Roshni

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#### **ABSTRACT:**

Herbal drugs are being used as well as recommended nowadays for all major health ailments. Carissa carandas (Karamarda) is one such herb which is native and common throughout much of India. It is a widely used medicinal plant by tribes throughout India and popular in various indigenous systems of medicine like Ayurveda, Unani and Homoeopathy. All parts of the plant are used in traditional medicine. It is commonly known as "karanda." It contains several phyto-chemical constituents belonging to terpenoid category. From literature survey, it has been found that the herbal drug contains wide variety of flavonoids, phenolic acids, steroids, volatile oils, lignans, alkaloids, polysaccharides and so on. It has a good nutritional value and is useful in multiple illnesses such as diarrhea, intestinal worms, skin ailments etc, various pharmacological activities have also been reported such as Anti microbial, Anti inflammatory, Antipyretic, Anti viral, Anti convulsant, Cardiovascular, Antidepressant, antiulcer, Anti diabetic, Antioxidant etc.

Keywords: Carissa carandas, Karanda, Phytochemicals, Flavonoids, Terpenoids, Herbal medicine, Pharmacological activities

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## | 0228 | Emulgel-Based Delivery of Pazopanib: A Novel Strategy for Psoriasis Treatment with In Vitro and In Vivo Insights

Khatoon, Nousheen\*, Firdous, Anjila, Hirwani, Meenakshi, Adnan, Mohammad, Chandrakar, Monika, Sharma, Roshni, Singh, Anurima

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## **ABSTRACT:**

Targeted and localised therapeutic approaches are necessary for psoriasis, a chronic autoimmune skin disorder marked by hyperproliferation and inflammation of keratinocytes. Although pazopanib, a tyrosine kinase inhibitor with anti-inflammatory and anti-angiogenic qualities, has potential for treating psoriasis, its clinical usefulness is limited by its systemic side effects and poor aqueous solubility. To maximise pazopanib's therapeutic efficacy and reduce systemic exposure, this study focuses on the development and assessment of a novel emulgel-based delivery system for topical administration. The formulation's desired physicochemical characteristics, including pH, spreadability, viscosity, and drug content, were attained by methodically evaluating gelling agents, emulsifiers, and permeation enhancers. Franz diffusion cells will be used for in vitro drug release and permeation studies, and rat skin will be used to evaluate ex vivo skin permeation. Two well-known animal models that resemble psoriasis were used to assess in vivo efficacy: the Complete Freund's Adjuvant (CFA) and formaldehyde-induced psoriasis. Histopathological investigations will confirm the condition of epidermal hyperplasia and inflammatory cell infiltration, and the pazopanib emulgel will decrease erythema, scaling, and skin thickness.

Keywords: Pazopanib, Emulgel, Psoriasis, Topical drug delivery, Tyrosine kinase inhibitor, In vitro release, In vivo evaluation, Skin permeation, Anti-inflammatory

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# | 0240 | Transcutaneous Delivery of A18 Nanoparticles via Microneedles Enables Dual Targeting for Psoriasis Treatment

Yadav, Krishna <sup>1\*</sup>, Nagori, Kushagra<sup>1</sup>, Jain, Parag<sup>1</sup>, Sharma, Mukesh<sup>1</sup>, Ajazuddin<sup>1</sup>, Singh, Manju<sup>2</sup>, Singh, Deependra<sup>2</sup>

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#### **ABSTRACT:**

Psoriasis is a chronic inflammatory skin disease characterized by keratinocyte hyperproliferation and infiltrating immune cells. New evidence specifies that cell-free DNA (cfDNA) released as a consequence of cellular damage contributes significantly to the inflammatory component of psoriasis. IL-17A (interleukin 17A) is a pro-inflammatory cytokine that drives the pathogenesis of psoriasis and is central to disease progression. In this study we describe the development of A18-cationic nanoparticles (A18-cNPs) which block the formation of a DNA-LL37 immunocomplex by competitive binding and downstream inflammatory signaling cascades. A18 also demonstrates selectivity for IL-17 receptors (IL-17R), inhibiting IL-17 receptor mediated mechanisms and IL-17 production. In order to improve transdermal delivery efficacy, A18-cNPs were prepared into dissolving microneedle (MN) patches. When the MN patches are applied to the skin, they dissolve in controlled manner in the interstitial fluid and allow for localized release and absorption of the nanoformulation. A18-cNPs ameliorated psoriatic lesions in a murine psoriasiform skin model, when used topically. Therapeutic effectiveness was systematically studied by using a macroscopic photographic record, PASI assessment, histological evaluations, immunohistochemical analysis, and quantitative histomorphometry. We observed prolonged cutaneous retention of A18-cNPs and very little systemic toxicity. We also investigated the biodistribution and skin permeation kinetics of the cNPs and measured circulating cfDNA and lesional cfDNA concentrations. Our results correspond to the therapeutic outcomes that were observed, and we suggest that this nanomedicine strategy offers a potentially novel treatment for inflammatory dermatoses. The collective work here demonstrates innovative understanding for the rational design of a transdermal delivery system, and an effective treatment for psoriasis.

Keywords: cfDNA, IL-17R small molecule A18, microneedles, cationic nanoparticles, psoriasis.

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## | 0243 | Predicting Drug Toxicity Using AI: In Silico Approaches to Reduce Animal Testing

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#### **ABSTRACT:**

Artificial intelligence for predicting drug toxicity is revolutionizing preclinical safety evaluations and reducing reliance on animal models. Computational in silico methods that utilize machine learning and computational modeling can effectively predict toxicological risks. These methods provide faster, cost-effective, and ethically sound alternatives to traditional approaches. For instance, MolToxPred employs stacked ML models to predict the toxicity of small molecules with high accuracy (AUROC > 87%), using structural and physicochemical properties to identify hazardous compounds early in the drug discovery process. AI-driven platforms like AlphaFold2 expedite target identification by predicting protein structures, while AtomNet assesses bioactivity and toxicity profiles to minimize animal testing. These AI approaches address the limitations of animal models in predicting human responses. By analyzing chemical interactions, QSAR models and molecular simulations can forecast mutagenicity, hepatotoxicity, and other risks, enhancing regulatory compliance. The FDA advocates for the adoption of computational methods such as Quantitative Systems Pharmacology and bioinformatics to replace animal models, emphasizing human-relevant outcomes. Moreover, AI enhances transparency through explainable AI (XAI), which clarifies the role of biomarkers in toxicity and refines risk assessment. The ethical and financial benefits of these technologies are significant: in silico screening lowers R&D costs by prioritizing safer candidates and aligns with the "3Rs" principle (Replace, Reduce, Refine), which aims to minimize animal testing. Despite challenges like standardization and model validation, advancements in feature selection and ensemble learning are enhancing reliability. With supportive regulatory frameworks, AI-based toxicity prediction could accelerate drug discovery, leading to safer medications and modernizing preclinical research.

Keywords: Artificial Intelligence, Drug Toxicity Prediction, In Silico Toxicology, Machine Learning, Animal Testing Reduction, Computational Drug Safety

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## | 0253 | Deep Learning-Based Model for Detecting Canine Babesia from Red Blood Cell Images

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> <sup>1</sup> Sibsagar University <sup>2</sup> Assam Agricultural University

#### **ABSTRACT:**

Modern medical science is growing rapidly with the contribution of several interdisciplinary fields such as advanced medical imaging techniques, computer vision, artificial intelligence (AI) etc. However, veterinary diagnostics, particularly for common parasitic infections like Canine Babesiosis, caused by Babesia spp., still lags behind. This life-threatening disease can be treated if diagnosed at an early stage. In this research, we presented a hyperparameter-tuned Convolutional Neural Network (CNN) with attention mechanisms for the automatic detection of Babesia parasites in canine red blood cell images. Our approach leverages AI to enhance veterinary diagnostics by automating feature extraction, which is further optimized using Principal Component Analysis (PCA) to improve computational efficiency and reduce overfitting. These optimized features are then classified using a voting ensemble of multiple Support Vector Machines (SVMs). Our Ensemble model achieved an improved accuracy of 96.5%, which is an improvement on individual SV The results of the experiments demonstrate that our CNN-attention mechanism-PCA-SVM method is effective, outperforming traditional methods by a large margin and providing veterinarians with an efficient early diagnosis method. This article is one of the only few models to address disease detection from microscopic images in animals using the potential of Artificial Intelligence.

Keywords: Babesia, CNN, Hyperparameter, Attention Mechanism, PCA, SVM-linear, SVM-Polynomial, SVM-RBF

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## | 0275 | "Beyond the Barrier: Innovations in Transdermal Therapeutic System"

Sahu, Harsha \*, Sharma , Roshni , Singh Lodhi , Juhi , Kaur , Kulvinder , Singh, Jyoti , Nagori, Kushagra

<sup>1</sup> Rungta College of Pharmaceutical Sciences and Research, Bhilai

#### **ABSTRACT:**

Compared to more conventional medication delivery methods, the transdermal route offers a number of benefits. These consist of stable medication plasma concentrations, no firstpass hepatic metabolism, great bioavailability, and non-invasive therapy. The stratum corneum, the skin's outermost layer, is the primary barrier preventing medication molecules from penetrating. Therefore, there is a lot of interest in researching ways to improve transdermal drug delivery (TDD) by getting past this barrier. The purpose of this review article is to discuss and offer commentary on the latest developments in TDD enhancement methods. To broaden the range of medications for which topical and transdermal delivery are feasible options and to improve bioavailability, skin penetration enhancement techniques have been developed. Since the Food and Drug Administration authorized the first transdermal medication patch about 40 years ago, a thorough analysis of the goods, industry, and technology is required. Patches are a novel method that allows for on-demand transdermal medication delivery. Nitro-glycerine patches received approval in 1981, and a number of patches for other medications, including nitro-glycerine, nicotine, fentanyl, clonidine, estradiol, oxybutinin, scopolamine, and testosterone, are currently available. Generally, the patches last one to seven days, depending on the medication. A unique membrane is used by the skin patch to control how quickly the liquid medication in the reservoir inside the patch enters the bloodstream through the skin. One possible method for both local and systemic drug delivery is the transdermal route of administration. Transdermal patches have less side effects and a greater therapeutic impact.

Keywords: Epidermal Pharmacokinetics, Cutaneous microchannel Transport, Patch-Intelligence Interfaces, Transdermosomal Carriers

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## | 0291 | Freckles: Pathogenesis, Clinical Insight, and Herbal Therapeutic Strategies – A Review

Wadibhasme, Pallavi\*

<sup>1</sup> Bharti Vishwavidalaya

#### **ABSTRACT:**

Freckles (ephelides) are benign hyperpigmented macules predominantly seen in individuals with fair skin. Although medically harmless, they raise cosmetic concerns and may reflect underlying photoaging. Current therapeutic approaches, while effective, are associated with adverse effects. This review aims to provide a comprehensive understanding of the etiology, pathogenesis, and current treatments of freckles, emphasizing the potential of herbal remedies. Botanical agents like Curcuma longa, Clitoria ternatea, Glycyrrhiza glabra, and Helianthus annuus have shown promising depigmenting and antioxidant activity, suggesting a safer and more sustainable therapeutic alternative.

Keywords: Freckles, Hyperpigmentation, Herbal therapy, Curcumin, Glabridin, Tyrosinase inhibition

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## | 0306 | Arogya-AI: An AI-Powered IoT Platform for Preventive Healthcare in Rural and Semi-Urban Communities

Sharma, Prishika\*, Shrivastava, Padmavati, Mishra, Srajal, Vaishnav, Govind, Atrey, Kushangi

Prishika Sharma (Rungta College of Engineering and Technology)\*, Padmavati Shrivastava (Rungta College of Engineering and Technology), Srajal Mishra (Rungta College of Engineering and Technology), Govind Vaishnav (Rungta College of Engineering and Technology), Kushangi Atrey (Rungta College of Engineering and Technology)

#### **ABSTRACT:**

In rural and semi-urban India, delayed diagnosis of preventable conditions such as hypertension and diabetes continues to be a critical healthcare challenge due to fragmented tools, limited access to diagnostics, and infrastructural limitations. Frontline health workers, such as ASHAs and ANMs, face persistent barriers in providing timely care, including reliance on siloed, high-cost medical devices and unreliable connectivity in lowresource environments. To bridge these gaps, we introduce Arogya-AI, an integrated AI-IoT platform designed to empower rural healthcare workers with real-time, data-driven decision-making. The system combines Bluetooth-enabled medical devices- blood pressure monitors, glucometers, pulse oximeters with a Flutter based mobile application for hassle-free data aggregation and analysis. The platform leverages edge AI (TensorFlow Lite) for low-latency, on-device processing of vital health parameters, ensuring functionality in questionable connectivity. Federated learning (PySyft) enhances privacy via decentralized model training across clinics without centralized data storage. Clinical risk thresholds follow global guidelines, hypertensive crisis (systolic ≥180 mmHg, AHA 2023), hypoglycemia (glucose < 70 mg/dL, ADA 2022) and severe hypoxia (SpO<sub>2</sub> < 90%, WHO 2021). Data security complies with India's Digital Personal Data Protection Act (2023) and National Digital Health Mission(NDHM). Planned pilot deployments will evaluate technical feasibility (device interoperability, uptime), usability (voice-guided regional language interfaces), and clinical efficacy (SHAP-based explainability of AI predictions). Successful deployment could reduce screening delays, improve ASHA adoption via intuitive design, and inform scalable AI-IoT policy integration in public health syste

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Keywords: AI-IoT, preventive healthcare, rural health, ASHA workers, edge computing, federated learning, explainable AI

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## | 0308 | Hyaluronic acid-coated modified chitosan nanoparticles mediated targeted delivery for the effective management of Rheumatoid Arthritis.

Verma, Astha\*, Kaur, Chanchal Deep<sup>2</sup>

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#### **ABSTRACT:**

Rheumatoid arthritis (RA) is a chronic inflammation of joints leading to cartilage damage and bone erosion marked by stiffness, loss of bone strength and persistent pain. Distribution of long- term conventional drug therapy in systemic circulation can lead to severe side effects. To overcome these challenges, a targeted drug delivery with therapeutic polymer derivative is used to develop nanocarrier. Glycyrrhetinic acid (GA) is a promising antiinflammatory bioactive which reduces various inflammatory cytokines (IL-6, IL-1β, and COX-2) with potential inhibitor of MAPK/NF-κB pathway which further downregulates proinflammatory factors in RA. Drug in therapeutic polymer is developed by conjugating GA with biodegradable polymer Chitosan, the synthetic product (GA-CS) was confirmed by infrared (IR) spectra and hydrogen-1 nuclear magnetic resonance. Sulfasalazine is encapsulated within the modified chitosan prepared by ionic gelation method and the chitosan nanocarrier (GA-CS/ SLZ) is coated with Hyaluronic acid (HA) for active targeting. The Box-Behnken factorial design (BBD)design was used to optimize the preparation process, GA-CS, SLZ, and HA were the independent variables considered for optimization, while the size of nanoparticles, zeta potential and polydispersity index (PDI) were the dependent variables. In- vitro studies revealed GA-CTS/SLZ nanoparticles had a mean particle size of 200 nm, a polydispersity index of 0.3, a zeta potential of +26.4 mV, and improved drug loading. SLZ exhibited comparative high and sustained release from GA-CTS/SLZ in an acidic pH of 5.5 than physiological pH of 7.4.

Keywords: Rheumatoid Arthritis, Glycyrrhetinic acid, Chitosan, Hyaluronic acid, Targeted delivery

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## | 0322 | Nano-based Delivery of Phyto-conmerging Strategies for Effective Rheumatoid Arthritis Treatment

Sahu, Dron <sup>1\*</sup>, Gupta, Sanjay<sup>2</sup>, Athbhaiya, Laxmi<sup>2</sup>

<sup>1</sup> MJ College Bhilai <sup>2</sup> Rungta College of Pharmaceutical Sciences Kohka Bhai

#### **ABSTRACT:**

Rheumatoid arthritis is a chronic, autoimmune disease primarily affecting joints, causing persistent inflammation, joint damage, pain, and function loss. Rheumatoid arthritis is an autoimmune condition affecting 0.5%-1% of the global population, more common in women and occurring at any age. Diagnosis is based on clinical presentation, laboratory tests, imaging, and medication. Management includes DMARDs, biologics, and NSAIDs Despite advances in diagnostic methods and therapeutic for symptom control. interventions, early detection, effective disease control, and prevention of long-term complications remain significant challenges. RA affects about 1% of the global population, with a higher prevalence in women and peak onset between 30 and 60. Delayed diagnosis of RA leads to irreversible joint damage, and the lack of biomarkers and personalized treatment hinders progress. The exact pathophysiological mechanisms are unclear, and research often overlooks low- and middle-income populations. Preventive strategies are often over looked. The study employs a mixed-method approach to study early-stage Rheumatoid Arthritis patients and high-risk individuals, utilizing clinical data, biological samples, and patient-reported outcomes, advanced biomarker discovery, machine learning algorithms, and digital health tools. Over the past two decades, research on Rheumatoid Arthritis has improved understanding and management, with key findings including improved diagnosis and classification using anti-CCP antibodies and rheumatoid factor. Advances in treatment include biologic DMARDs like TNF inhibitors, IL-6 inhibitors, and JAK inhibitors, revolutionizing RA therapy and improving long-term outcomes. The future of rheumatoid arthritis research will focus on precision medicine, preventive strategies, novel therapeutic targets, regenerative therapies, and global health accessibility, using genomic, proteomic, and metabolomics profiling for personalized treatment plans.

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Keywords: DMARDs, NSAIDs, IL-6 inhibitors, JAK inhibitors

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## | 0323 | Polysaccharide-Based Injectable Self-Healing Hydrogels: Exploring Their Potential for Wound Healing

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#### **ABSTRACT:**

Significant progress has been achieved in wound healing therapies in recent decades, mostly as a result of the creation of hydrogels based on biopolymers. These injectable selfhealing hydrogels have garnered a lot of attention due to their special qualities, which include printability, injectability, and reversible chemistry. Injectable polysaccharidebased self-healing hydrogels have many advantages over conventional hydrogels. They greatly advance customized treatment as they can be made to match specific individuals. These hydrogels change in situ after injection to generate a material that efficiently fills the whole lesion in all three dimensions, reaching deep and irregular lesions. Hydrogels that are injectable and self-healing are also essential for encouraging tissue regeneration. In addition to provide mechanical support and facilitating the local recruitment and regulation of host cells, their diffusive and viscoelastic features enable the controlled spatiotemporal distribution of cells or medicines. As a result, these hydrogels are perfect for treating chronic wounds and have transformed cutting-edge methods of tissue regeneration. In order to shed light on this quickly developing field, this review paper offers a thorough classification of injectable self-healing hydrogels that are frequently used in chronic wound repair as well as a thorough analysis of the different ways that these hydrogels are used to treat chronic wounds.

Keywords: Self-healing hydrogels, Biopolymer-based hydrogels, Tissue regeneration, Personalized medicine, wound healing

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# | 0325 | Reprogramming pancreatic Alpha cell to beta like cell, A novel approach for treatment of diabetes.

Rajgopal, B.<sup>1\*</sup>, Patel, Anjali<sup>1</sup>, sakure, Kalyani<sup>1</sup>, Jaiswal, Manisha<sup>2</sup>, Sahu, Chiranjeev<sup>2</sup>, Sahu, Girish<sup>1</sup>

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### **ABSTRACT:**

Pancreatic endocrine cells are categorized in to 5 types (alpha, beta, delta, pancreatic polypeptide cells and epsilon), which expresses glucagon, insulin, somatostatin, pancreatic polypeptide, and ghrelin, respectively. Several studies including lineage tracing in Ins2Akita diabetic mice have been done to investigate the identities of pancreatic endocrine cells which concludes, alpha cells have enormous plasticity, which enables them to be reprogrammed by specific transcription factors into insulin secreting beta like cells. Gene therapy has provided the beneficial outcome. Pdx1, MaFA and PAX4 (the transcription factors) in alpha cells can be over expressed which results in reprogramming the targeted alpha cells into beta cells. This trans-differentiation may be induced by infusing an adenoassociated virus (AAV) loaded with distinct transcription factors in the duct of pancreas. Several researches have demonstrated the successful restoration of enhanced insulin secretion in diabetes induced mice. Additionally ductal neurogenin3 (Ngn3), Sglt2 inhibitors, Igfbp1, GLP1 and several clinical and non-clinical agents has been postulated as a basis of beta cell neogenesis. Alpha cell owing to its high plasticity, on prolonged exposure to GABA reprogrammed into beta-like cell due to downregulation of Arx expression by GABA. The various approaches for beta cell neogenesis open a new window towards the establishment of novel gene therapy accession to treat diabetes. However, broad studies are still needed to improve and optimize this treatment methodology. The potentiality of endogenous pancreatic alpha cell to beta cell conversion methods and its outcomes are invigorating. This accomplishment is presently being under trial in nonhuman primates.

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## Keywords: Alpha cell, Beta cell, Gene therapy, Reprogramming, Transdifferentiation

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# | 0326 | Role of immunotherapy in treatment of breast cancer

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#### **ABSTRACT:**

Recent progress in immunobiology has led the way to successful host immunity enhancement against breast cancer. In triple-negative breast cancer, the combination of cancer immunotherapy based on PD-1/PD-L1 immune checkpoint inhibitors with chemotherapy was effective both in advanced and early setting phase 3 clinical trials. These encouraging results lead to the first approvals of immune checkpoint inhibitors in triple-negative breast cancer and thus offer new therapeutic possibilities in aggressive tumors and hard-to-treat populations. Furthermore, several ongoing trials are investigating combining immunotherapies involving immune checkpoint inhibitors with conventional therapies and as well as with other immunotherapeutic strategies such as cancer vaccines, CAR-T cells, bispecific antibodies, and oncolytic viruses in all breast cancer subtypes. This review provides an overview of immunotherapies currently under clinical development and updated key results from clinical trials. Finally, we discuss the challenges to the successful implementation of immune treatment in managing breast cancer and their implications for the design of future clinical trials.

Keywords: Tumors, Checkpoint inhibitors, CAR-T Cell, Immunotherapy, Breast cancer

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## | 0333 | Topical Hydrogel of Polymeric Nanoparticle-Encapsulated AXP-15 for Targeted Anti-Inflammatory Therapy

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### **ABSTRACT:**

AXP-15 is a novel anti-inflammatory agent with strong potential to suppress key proinflammatory mediators involved in chronic and acute inflammatory conditions. However, its clinical application is limited by low aqueous solubility, instability in systemic circulation, and potential systemic side effects. To overcome these limitations, this study presents the development of a topical hydrogel-based formulation of AXP-15 loaded into smart polymeric nanoparticles, aiming for localized, sustained, and targeted drug delivery. Polymeric nanoparticles were prepared using the solvent evaporation technique, employing PLGA (poly(lactic-co-glycolic acid)) as the biodegradable polymer. The nanoparticles were engineered to be pH-sensitive, allowing drug release in response to the acidic microenvironment typically present at inflamed sites. The optimized nanoparticles had a mean particle size of ~120 nm, high encapsulation efficiency (>85%), and sustained release behavior over 48 hours. These nanoparticles were subsequently incorporated into a biocompatible carbopol-chitosan hydrogel matrix, forming a stable, easy-to-apply topical system. In vitro release studies demonstrated pH-dependent release, with enhanced drug release under mildly acidic conditions (pH 5.5). Anti-inflammatory efficacy was validated in LPS-stimulated macrophage cultures, where the AXP-15 nanoparticle hydrogel significantly inhibited TNF-α and IL-6 expression compared to the free drug. In vivo testing using a carrageenan-induced paw edema model in rats showed superior antiedematous effects, prolonged drug retention at the site of inflammation, and minimal systemic absorption, confirming localized action. The formulation holds promise for



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clinical translation in managing conditions like dermatitis, arthritis, and localized inflammation, aligning with principles of precision medicine and sustainable healthcare.

Keywords: Inflammation, pH dependent release, paw edema, nanoparticle, drug release

# | 0334 | Treatment of Eye diseases with preservative free formulations-An alternate approach

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#### **ABSTRACT:**

Reviewing and summarizing the body of research on preservatives' effects on the eye, offering helpful advice for the clinical evaluation of the ocular surface in glaucoma patients, and identifying patient groups that may benefit from topical preservatives free medications and recommendation for the alternative approach are the goals of this study. Methods: A review of the literature on preservatives and the eye, as well as the professional judgment of ophthalmologist with an interest in ocular surface disease, served as the foundation for this paper. Findings: There are so many literatures indicating the possibility of the ocular surface toxicity due to the presence of the preservatives and many ways have been researched to avoid the same, but there are still some misunderstandings about how to utilize them properly. For those receiving topical long-term treatment for ocular diseases like glaucoma and dry eye syndrome have an urgent need of a medicine without preservative. In conclusion, this review offers a current overview of the research on preservatives and the eye, along with recommendations of the alternative approaches to avoid the preservative induced toxicity.

Keywords: Glaucoma, eye, clinical, syndrome

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## | 0354 | Complex Relationship Between Atherosclerosis-Related Epigenetic Processes and Transcription Factors

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### **ABSTRACT:**

In terms of global mortality, cardiovascular illnesses (CVD) including heart disease and stroke are at the top. Atherosclerosis, characterized by a pathological accumulation of plaque inside the artery walls, is a low-grade inflammatory disease of the vasculature and a key component of CVD. Investigations into the transcriptome alterations associated with atherosclerosis development have revealed the centrality of transcription factor and epigenetic regulation of gene expression. Reversible chromatin remodeling has provided scientific backing for the clinical use of chromatin-modifying drugs in the prevention and treatment of cardiovascular disease. Additionally, other transcription factors have been recognized as possible therapeutic targets in the fight against atherosclerotic CVD in preclinical investigations. Not many research have taken into account the fact that transcription factors and epigenetic mechanisms work together to regulate genes, especially when it comes to cardiovascular disease. We focused on this neglected gene regulatory mechanism in atherosclerosis to shed light on the mechanisms behind new treatments that target epigenetic modifiers and transcription factors in this disease.

Keywords: Cardiovascular diseases, Atherosclerosis Epigenetics Transcription Factor Chromatin Remodelling, Epigenetic Modifiers

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## | 0357 | Formulation and Evaluation of Paracetamol **Microspheres Using Emulsion Solvent Evaporation** Method

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#### **ABSTRACT:**

Paracetamol microspheres were prepared employing the emulsion solvent evaporation technique with Eudragit S100 as the polymer. A W/O/W double emulsion was produced with a solvent mixture of isopropyl alcohol, ethanol, and dichloromethane, and polysorbate 20 and PVA as surfactants. Microspheres were separated by centrifugation, washed, and freeze-dried. Characterization revealed good yield, regular particle size, and high entrapment efficiency, suggesting the suitability for controlled release drug delivery.

Keywords: Microspheres, W/O/W Double Emulsion, Emulsion Solvent Evaporation

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## | 0372 | Harnessing the cGAS/STING Pathway: A Paradigm Shift in Targeted Therapy for Gastrointestinal Cancers.

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#### **ABSTRACT:**

GI tumors such as colorectal, gastric, and liver are a global health burden due to their high morbidity and drug resistance. cGAS/STING signaling is pivotal in the regulation of innate immunity, linking DNA sensing with anti-tumor immunity. Recent advances in precision oncology take advantage of this signaling for regulation of tumor heterogeneity, increasing immune surveillance, and improving therapy. This talk discusses cGAS/STING signaling in GI tumorigenesis, demonstrating its function in triggering the immune response to inhibit cancer and generating an immunosuppressive tumor microenvironment. We also briefly discuss its association with DNA damage response, NF-kB, and autophagy and recent advancements in therapy such as nanotechnology-drug delivery and biomimetic formulations. The combination of cGAS/STING therapies with immunotherapy is promising to enhance anti-tumor immunity, reverse drug resistance, and improve patient survival. The future will be mapped towards biomarker-driven therapy, best-in-class combinations of agents, and novel delivery for gastrointestinal cancer therapy. The targeting of the cGAS/STING pathway represents a paradigm shift in oncology that will usher in next-generation cancer immunotherapy

Keywords: cGAS-STING Pathway, Immunotherapy, Nanotechnology, Targeted Drug Delivery

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## | 0374 | Para Amino Benzoic Acid: A Promising Coformer for Co-crystal Formation to tailor the Solubility, Bioavailability and Physicochemical Properties of Poorly Soluble Drugs

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### **ABSTRACT:**

The enhancement of solubility and bioavailability of poorly water-soluble drugs remains a persistent challenge in pharmaceutical development. Co-crystallization has emerged as a promising crystal engineering strategy to overcome these limitations by modifying the physicochemical properties of active pharmaceutical ingredients (APIs) without altering their pharmacological activity. Para-aminobenzoic acid (PABA), a biocompatible and multifunctional molecule, has gained attention as an effective coformer in co-crystal formation due to its ability to participate in robust hydrogen bonding and  $\pi$ - $\pi$  stacking interactions. This study explores the potential of PABA as a coformer for developing pharmaceutical co-crystals aimed at improving the solubility, dissolution rate, stability, and bioavailability of poorly soluble drugs. A systematic review of co-crystal design, synthesis methods (including solvent evaporation, grinding, and slurry techniques), and characterization techniques such as powder X-ray diffraction (PXRD), differential scanning calorimetry (DSC), Fourier-transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM) is presented. Case studies involving model drugs like carbamazepine, indomethacin, and sulfadimidine demonstrate how PABA-based co-



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crystals exhibit enhanced aqueous solubility and improved pharmacokinetic profiles. Furthermore, the influence of PABA on the crystallinity, melting point, and hygroscopicity of the co-crystals is analyzed to assess stability under different storage conditions. Overall, this work highlights PABA as a versatile and pharmaceutically acceptable coformer that enables rational design of drug co-crystals with optimized therapeutic performance. These findings support the strategic use of PABA in co-crystal engineering as a viable pathway to address solubility-related challenges in drug development.

Keywords: Para amino benzoic acid, Coformer, Solubility, Bioavailability, Cocrystallization, poorly soluble drugs

## | 0383 | Future therapy stages for Alzheimer's and Parkinson's disease based on CRISPR delivery technology

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#### **ABSTRACT:**

Crisper technology is shaping the future, as Alzheimer's and Parkinson's diseases are the most common neurodegenerative conditions, defined by progressive cognitive and movement impairments. Current treatments mostly treat symptoms without affecting disease progression. CRISPR genome editing has emerged as a ground-breaking technique with the ability to precisely target and change genes implicated in the pathophysiology of various illnesses. However, the problem of rapidly and securely transporting CRISPR components over the blood-brain barrier is impeding its practical application. This study focuses on the most recent breakthroughs in CRISPR delivery methods, including as viral vectors, non-viral systems like lipid nanoparticles, exosomes, and polymer-based carriers that are specifically designed for central nervous system targeting. We explore ways for improving delivery specificity, lowering immunogenicity, and reducing off-target effects. We suggest a future therapeutic strategy that includes early detection, gene-targeted interventions, and long-term neuroprotection. A breakthrough strategy to treating Alzheimer's and Parkinson's disease could be realized by combining new delivery technologies with CRISPR precision. This study provides a complete overview of how CRISPR delivery systems may shape the future generation of neurodegenerative disease therapeutics

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Keywords: Breast cancer, ultrasound, explainable artificial intelligence, deep learning

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## | 0391 | Design and Evaluation of a Stimuli-Responsive Nanogel Loaded with Corticosteroids for Targeted and Sustained Intra-Articular Delivery in Rheumatoid Arthritis Therapy

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#### **ABSTRACT:**

Rheumatoid arthritis is a chronic autoimmune disorder characterized by a persistent synovial inflammation, leading to joint destruction. Conventional systemic administration of corticosteroids, though effective in reducing inflammation, is often limited by frequent dosing and systemic side effects. Overcoming these challenges requires a targeted, sustained-release approach to deliver corticosteroids. To achieve these characteristics and improve the therapeutic efficacy of anti-arthritic corticosteroids, we have developed lipidic nanoparticles by the emulsification solvent evaporation method and optimized. The optimized nanoparticles were in the range of 68-155nm and were efficient in loading a significant amount of drug, which showed controlled release of the formulation up to 12 hours. To further enhance the release profile, we have developed an in-situ gel that prolongs the release of the drug for up to 7 days. The final formulation was worth containing corticosteroid nanoparticles in an in-situ gel, which was further evaluated for pH, Viscosity, Texture, gelling ability, and spreadability. We conclude that our formulation was capable of prolonging the release from 12 hours to 7 days compared to plain nanoparticle, which can further be expanded in an animal model.

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Keywords: Autoimmune condition, Inflammation, Corticosteroids, Controlled release

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## | 0394 | Metabolic Dysfunction and Neurodegeneration: The Central Role of Insulin/IGF-1 Signaling in Diabetic Encephalopathy and Alzheimer's Disease

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#### **ABSTRACT:**

Recent studies suggest a potential correlation between metabolic dysfunction and neurodegenerative processes. Metabolic disorders such as obesity and type 2 diabetes hallmarks - insulin resistance, oxidative stress, and chronic inflammation have been involved in the pathogenesis of various neurodegenerative conditions. Insulin plays a significant role in regulating cognitive functions, oxidative stress, hippocampal synaptic plasticity. Insulin/IGF-1 signaling disruption is increasingly acknowledged as a major pathological mechanism underlying both diabetic encephalopathy (DE) and Alzheimer's disease (AD). Both of these conditions have different etiologies but they share common ground features such as insulin resistance in the brain, oxidative stress, mitochondrial dysfunction, and neuroinflammation. Thus, AD is also termed "type 3 diabetes" by many scientists. This review examines the central role of the insulin/IGF-1 signaling in the pathogenesis of both DE and AD, highlighting the shared and distinct pathways of both conditions and considers the possibilities of targeting insulin/IGF-1 signaling as a therapeutic strategy. Understanding this connection may provide insights from one disease which may inform treatment approaches for the other.

Keywords: Metabolic dysfunction, neurodegenerative processes, Alzheimer's disease, diabetic encephalopathy, insulin/IGF-1 signaling

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## | 0401 | Enzyme-Responsive Natural Polysaccharide-Based Nanocarriers for RNA Drug Delivery in Cancer Therapy: Current Status and Future Perspectives

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#### **ABSTRACT:**

Because of their ability to modulate the immune system and regulate specific genes, RNAbased medicines have changed the face of cancer treatment. Due to their fragility and sensitivity to enzyme degradation, RNA molecules provide a significant obstacle to efficient and targeted distribution. This study provides a high-level summary of the oncological significance of RNA-based therapies, including siRNA, miRNA, mRNA, and aptamers. Exosomes, liposomes, polysaccharides, and a wide variety of protein-based carriers derived from plants and animals are described as natural nanocarriers. Highlighted here are the adaptability of albumin, gelatine, zein, and soy proteins for biocompatible RNA delivery. The review primarily focusses on enzyme-sensitive systems that enable site-targeted drug delivery. We investigate how tumor-related enzymes like cathepsin and glycosidase, as well as proteases and nucleases, and matrix metalloproteinases (MMPs), help release the RNA payload in the cancer microenvironment. We also go into detail on how to make and alter the surface of smart nanocarriers so that they can carry these enzyme-sensitive components with pinpoint accuracy. Finally, we go over the expanding biomedical applications of these systems, including drug delivery, bioimaging, and biosensing, with an eye on resolving existing issues and preparing for potential future translational uses. Utilising advances in synthetic biology and nanotechnology, the future

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of cancer treatment should centre on the development of adaptable, stimulus-controlled nanocarriers for individual cancer types.

Keywords: mRNA, siRNA, natural nanocarrier, cancer

## | 0402 | Biosimilars Based Novel Drug DeliveryTechnology and Biomedical Application: Current Perspectives and Future Opportunities

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## **ABSTRACT:**

Biosimilars are biological products that replicate their reference biopharmaceuticals. These are created following the patent expiration of innovator biopharmaceuticals and are filed for distinct marketing approval. It highlights the basic traits of biosimilars, FDA and EMA-based regulatory systems, and differences from generics. The study emphasizes approved biosimilars across various therapeutic areas and the changing scene of drug distribution. It also addresses developments in formulation and administration to improve bioavailability, patient compliance, and therapeutic efficacy. Promising next-generation biosimilars include advances in injectable delivery systems, nanotechnology, and investigation of oral, transdermal, and inhaled routes. The review also addresses manufacturing complexity, stability problems, and patient-physician acceptance. Future prospects include tailored medicine approaches, AI-driven formulation design, and developing delivery technologies. Biosimilars have the potential to enhance patient accessibility for various malignant and nonmalignant conditions by lowering treatment costs. This review aims to guide researchers and industry players towards more efficient, safe, and patient-friendly biosimilar therapies.

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Keywords: Biosimilars, Novel Drug Delivery Systems, Biomedical Applications, FDA, EMA, Formulation Trends, Transdermal Biosimilars, Personalized Medicine, Targeted Delivery Systems

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# | 0403 | From SSRIs to Psychedelics: Evolution of Antidepressant Pharmacotherapy

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#### **ABSTRACT:**

Depression remains one of the most prevalent and debilitating psychiatric disorders worldwide, demanding continual evolutions in pharmacological treatment strategies. This review explores the historical and contemporary advancements in antidepressant pharmacotherapy, tracing the development from conventional selective serotonin reuptake inhibitors (SSRIs) to emerging psychedelic-based treatments. SSRIs, along with tricyclic antidepressants (TCAs) and monoamine oxidase inhibitors (MAOIs), have long been the cornerstone of depression management by modulating monoaminergic syste However, limitations such as delayed onset of action, treatment resistance, and side effect burden have necessitated the exploration of novel mechanis Recent breakthroughs in glutamatergic modulation—especially via NMDA receptor antagonists like ketamine—have introduced rapid-acting antidepressants into clinical practice. Furthermore, the resurgence of interest in psychedelic compounds such as psilocybin and MDMA marks a paradigm shift in the therapeutic landscape, offering promising outcomes through mechanisms involving neuroplasticity and altered consciousness. This review discusses the pharmacodynamics, clinical efficacy, safety profiles, and regulatory challenges of both traditional and novel agents, highlighting the dynamic trajectory of antidepressant development. It also

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addresses the future direction of precision psychiatry, emphasizing personalized medicine and biomarker-driven approaches in optimizing depression treatment

Keywords: Depression, SSRI, Treatment-resistant depression, Precision psychiatry, Psychopharmacology

## | 0404 | "Advances in Green Chemistry Approaches for the Synthesis of Heterocyclic Compounds: Trends, Techniques, and Future Perspectives"

Kulvinder Kaur\*<sup>1</sup>, Deepika Sahu <sup>2</sup>, Rashnita Sharma <sup>2</sup>, Anshita Shukla <sup>2</sup>, Akansha Thakur <sup>1</sup>, Harsha Sahu <sup>1</sup>

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## **ABSTRACT:**

Heterocyclic compounds represent a crucial class of organic molecules widely utilized in pharmaceuticals, agrochemicals, and materials science due to their diverse biological and physicochemical properties. Traditionally, the synthesis of these structures has relied on methods that involve toxic reagents, volatile organic solvents, and energy-intensive processes, raising significant environmental and safety concerns. In response, green chemistry has emerged as a sustainable alternative, emphasizing the design of safer, cleaner, and more efficient synthetic strategies. This review comprehensively explores the recent advances in green chemistry techniques for the synthesis of various heterocycles such as pyrroles, thiadiazoles, triazoles, pyridines, imidazoles, thiazoles, and quinolines. Key methodologies discussed include solvent-free synthesis, microwave-assisted and ultrasound-assisted reactions, use of bio-based and water as solvents, catalytic systems involving ionic liquids, deep eutectic solvents, and heterogeneous catalysts.

Keywords: Green Chemistry, Hetrocyclic, microwave-assisted, ultrasound

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## | 0405 | Recent Review on Herbs and Medicinal Plantbased Nanotechnological Approach in Treating Psoriasis

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### **ABSTRACT:**

Psoriasis is a long-term inflammatory skin condition that is caused by a typical proliferation of keratinocytes that emerge as substantial scaly, red and fragile patches. Although in current therapy, conventional treatments usually involve topical corticosteroids, immunosuppressants, and phototherapy, these therapies have restrictions and undesirable consequences. Nanotechnology provides significant novel opportunities for enhancing drug distribution and clinical effectiveness. The study focuses on a novel herb-based nanotechnological technique in treating psoriasis. The application of nanotechnology in herbal products has the potential to enhance the bioavailability, stability, and controlled administration of active substances, hence maximising therapeutic outcomes and minimising undesirable effects. Niosomes, liposomes, and nanoemulsions facilitate the penetration of herbal extracts such as aloe vera, turmeric, neem, and chamomile into the skin layers, along with providing anti-inflammatory, antioxidant, and immunomodulatory effects. This novel approach has the potential to strengthen therapeutic results, reduce adverse effects, and increase patient compliance. Also, the application of herbal extracts is consistent with the growing trend of natural and alternative healthcare treatments. Medicinal plants, nanoparticle, psoriasis, skin, corticosteroids, keratinocytes

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Keywords: Medicinal plants, nanoparticle, psoriasis, skin, corticosteroids, keratinocytes

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## | 0407 | Nanotechnology-Based Approaches for Targeted Treatment of Chronic Inflammatory Disease

Anshita Shukla\*<sup>1</sup>, Rashnita Sharma <sup>1</sup>, Akansha Thakur <sup>1</sup>, Kulvinder Kaur <sup>2</sup>, Mansee Nagdev <sup>1</sup>, Juhi Lodhi <sup>1</sup>

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### **ABSTRACT:**

Chronic inflammatory conditions such as rheumatoid arthritis, inflammatory bowel disease, and multiple sclerosis present considerable therapeutic problems due to their complex pathophysiology and systemic adverse effects. Conventional anti-inflammatory medications frequently have poor specificity, which results in side effects and poor effectiveness. Nanomaterials provide a novel platform for individualised and targeted therapeutic treatments because of their special physicochemical characteristics, which enable preferred accumulation at inflammatory areas, regulated release, and improved drug solubility. Smart nanocarriers that react to disease-specific stimuli have been developed recently, allowing for precise medication release at the site of inflammation. These nanocarriers decrease systemic toxicity, increase therapeutic efficacy, and make it possible to track the course of a disease and its response to treatment in real time. Enhancing scalability, regulatory approval procedures, and biocompatibility are the main goals of future advancements.

Keywords: Chronic inflammation, Rheumatoid Arthritis, Nanomaterials

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### | 0417 | Emerging Trends in Hydrogel for Treatment of Vaginal Candidiasis

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#### **ABSTRACT:**

This review discusses the use of hydrogel systems for intravaginal drug delivery, specifically antibacterial, anti-trichomonas, and anti-fungal regimens for managing and treating gynecological infections, particularly vaginal candidiasis. 80% of females worldwide have encountered candida albicans, the root cause of vulvovaginal candidiasis (VC). VC is manifested by inflammation, itching, erythema, dyspareunia, and pain in the infected vaginal mucosal area. Long-term use of antibiotics, immune-suppressants, contraceptive pills, use of intra-uterine devices, vaginal douching, unprotected sexual intercourse, pregnancy, and hyperglycemic condition are the major factors that affect vaginal flora and may cause VC. Conventional dosage forms such as creams, ointment, powder, pessaries, etc. are used in VC treatment, however, they have some serious limitations such as short mucosal contact, rapid vaginal flush or discharge, or poor mucosal absorption. Researchers developed several novel hydrogel preparations such as mucoadhesive, pH or temperature-sensitive, or other polymeric hydrogels to overcome these limitations. This study aims to provide information on the pathophysiology, and diagnosis of VC, and recently developed hydrogels for its treatment, which utilize a solgel system where gel formation takes place in vaginal conditions. Drug-exempted systems

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exhibiting antifungal worriedness are overcome by hydrogel, which also facilitates their wardship and proper distribution in the vaginal mucosa.

Keywords: Intravaginal drug delivery, Vulvovaginal candidiasis, Smart Hydrogels, Vaginal formulations, Gynecological infections, pharmaceutical carriers, Candida Albicans Treatment

### | 0423 | Stimuli-Responsive Nanoparticles in Cancer Therapy: A Smart Approach to Precision Drug Delivery

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#### **ABSTRACT:**

Stimuli-responsive nanoparticles represent a significant advancement in targeted cancer therapy by offering controlled and site-specific drug release in response to internal or external triggers. These "smart" nanocarriers are engineered to respond to tumor-specific conditions such as pH variation, redox gradients, enzyme overexpression, hypoxia, or external stimuli like temperature, light, magnetic fields, and ultrasound. Such responsiveness enhances the therapeutic index of anticancer agents by minimizing systemic toxicity and improving accumulation at tumor sites. pH-sensitive liposomes, redox-responsive polymeric nanoparticles, and light-triggered gold nanoshells are among the most promising systems under investigation. Recent research has demonstrated the successful incorporation of dual and multi-stimuli responsive mechanisms to further refine delivery precision and therapeutic efficacy. Despite encouraging preclinical outcomes, challenges such as nanoparticle stability, biocompatibility, and scalable manufacturing continue to hinder clinical translation. This review summarizes recent developments in stimuli-responsive nanoparticle systems, their mechanisms, clinical progress, and future directions the precision oncology. in context of

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Keywords: Stimuli-responsive nanoparticles, cancer nanomedicine, pH-sensitive drug delivery, redox-responsive systems, smart nanocarriers, tumor microenvironment, controlled release, precision oncology, targeted therapy, nanotechnology in cancer

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## | 0429 | Targeting E6 and E7 Oncoproteins in Cervical Cancer: Disrupting HPV-Induced Malignancies by Modulating Cellular Pathways

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#### **ABSTRACT:**

High-risk human papillomaviruses (HPVs), especially types 16 and 18, are the causative agents most commonly associated with cervical carcinoma. The E6 and E7 oncoproteins of HPV are always expressed in the HPV cervix tumors and are central to the initiation and maintenance of malignancy. E6 promotes the degradation of the tumor suppressor protein p53, in part through its assembly with the E6AP (E6-associated protein), and compromised apoptosis and genetic instability. Simultaneously, E7 binds and inactivates the retinoblastoma protein (pRb), resulting in release of E2F transcription factors that mediate deregulated cell growth. In addition to these pathways, E6 and E7 regulate several other cellular pathways that are involved in PI3K/AKT, Wnt/\u00b3-Catenin, and Notch signaling, resulting in metabolic reprogramming, immune evasion, and metastasis. Therapeutic approaches against these oncoproteins have been encouraging, as small interference RNAs (siRNAs) to E6 and E7 can result in the reconstitution of tumor suppressor pathways and the suppression of tumorigenesis. These approaches may help to improve the prognosis and contribute to relieving the worldwide burden of cervical cancer by targeting the molecular determinants of HPV-induced neoplasia, including, for example, the E6 and E7 oncoproteins.



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Keywords: Human papillomaviruses (HPVs), Cervical cancer, Oncoproteins E6 and E7, p53 protein, retinoblastoma protein (pRb), Tumor

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# | 0440 | Emerging Drug Therapies for Alzheimer's Disease: A Review of Investigational Agents Awaiting Market Launch"

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#### **ABSTRACT:**

Alzheimer's Disease (AD) is a progressive and irreversible neurodegenerative disorder that represents the most common cause of dementia globally. It is characterized by gradual cognitive decline, memory impairment, and behavioral changes, profoundly affecting patients and caregivers. Current therapeutic approaches, such as cholinesterase inhibitors and NMDA receptor antagonists, primarily offer symptomatic relief without halting disease progression. Recent breakthroughs have introduced disease-modifying therapies (DMTs) targeting amyloid-beta and tau protein pathologies, including monoclonal antibodies like Aducanumab, Lecanemab, and Donanemab. In addition, innovative modalities like mRNA-based therapies, gene-editing techniques, and stem cell approaches are under active investigation. Advances in drug delivery systems, including nanoparticles, liposomes, and intranasal delivery methods, have shown promise in enhancing targeted brain therapy. Artificial intelligence and biomarker-based drug development are revolutionizing clinical trial designs and therapeutic discovery pipelines. Despite these encouraging advancements, challenges such as high treatment costs, clinical failures, regulatory hurdles, and limited accessibility remain significant barriers. This review article comprehensively explores the epidemiology, pathophysiology, current treatment strategies, emerging therapies, novel delivery systems, ongoing clinical trials, and vaccine



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development efforts, highlighting the evolving landscape of Alzheimer's Disease management by 2025 and beyond.

Keywords: Alzheimer's diseases, recent treatments, Monoclonal antibodies

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#### | 0457 | Treatment Approaches for Psoriasis and Psoriatic Arthritis: A Short Review

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#### **ABSTRACT:**

Currently, there are no established diagnostic criteria or tests for Psoriatic Arthritis (PsA), a complex inflammatory disease with a wide range of clinical features that aggravates psoriasis in 30% of patients. New drug delivery and drug carrier systems have been developed as part of a strategy to increase the safety, effectiveness, and comfort of topical treatment. The topical methods of treatment for psoriasis and psoriatic arthritis are included in this review. Nowadays, the first line of treatment for mild to severe psoriasis is topical therapy. Issues including medication targeting and skin permeability impact the therapeutic outcome. At the moment, methotrexate and cyclosporine A are popular among new carriers. Because of their greater skin penetration and drug-carrying capacity, lipid-based nano delivery systems can increase local drug action, accomplish targeted drug release, and lessen the negative effects of medication therapy. When compared with lipid-based nano delivery systems, polymer-based carriers, metallic nanocarriers, and nanocrystals have wide range applications owing to their controllable particle size, easy modification, and better drug loading ability. This systematic overview indicates that future research should

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focus on developing novel drug delivery systems characterized by enhanced stability, biocompatibility, and drug carrying capacity.

Keywords: Psoriasis, drug delivery, topical methods, carriers, local delivery

### | 0471 | Revolutionizing RNA-Targeting Therapeutics, Emerging Technologies, Delivery Innovations, and AI-Driven Strategies for Next-Generation Treatments: An overview

Hina Sahu\*<sup>1</sup>, Mukesh Sharma <sup>1</sup>, Parag Jain <sup>1</sup>, Kushagra Nagori <sup>1</sup>, Ajazuddin ... <sup>1</sup>, Krishna Yadav <sup>1</sup>

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#### **ABSTRACT:**

The distinctive emergence of RNA-targeting therapies as a powerful therapeutic approach to a variety of illnesses is radically shifting the landscape of modern medicine. Emphasizing a multidisciplinary approach, before diving into applications, we discuss the structural and functional features of RNA relevant to drug design and an increasing appreciation for RNA as a flexible and dynamic target in therapeutic research. The example of several current treatment modalities are highlighted, including RNA-editing technologies, such as CRISPR, small molecule binders, microRNAs, siRNAs, and antisense oligonucleotides (ASOs). Moreover we explore several new platforms that are pushing the precision of RNA modulation, such as RNA-targeting PROTACs, modular RNA-protein conjugates and RNA scaffolds in synthetic biology. Furthermore we also cover procedural advancements in delivery methods, like lipid nanoparticles, extracellular vesicles and modified viral and non-viral vectors that promise to enhance the stability, bioavailability and targeted cellular uptake of the RNA-based therapeutic of interest. The combination of computational biology and artificial intelligence (AI) is changing the way

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we conduct RNA drug discovery. New RNA modulators can be designed, targets prioritized, and RNA structures predicted, quickly using big data and machine learning frame works .Also, machine learning which can rationally design RNA modulators, prioritize targets, and perform predictive modeling at speed and precision never experienced before. This review delivers a forward-looking a perspective on how new delivery methods, AI-driven strategies, and future technologies are all working together to transform the RNA therapeutic landscape and open up opportunities to safer, more individualized, and more effective treatments.

Keywords: RNA- targeting, drug discovery, AI-diven, siRNAs

## | 0481 | Targeting Estrogen Receptors (ER) with Plant Bioactives: A Molecular Docking Approach for Breast Cancer Therapy

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#### **ABSTRACT:**

Breast cancer (BC) continues to be most common malignant neoplasm affecting women all over the world. The adverse effects of existing anti-cancer drugs as well as surgery are well known documented. Therefore, there is a pressing need to investigate safer, more effective alternative medicines with negligible or no side effects. Herbal approach suggests towards the utilization of traditional medicinal herbs to create medications derived naturally from plants. Many traditional herbs and their bioactives are still now unexplored. The plant bioactives exhibits anti-BC effects through a range of diverse mechanisms, including increase in apoptosis and induction of cell cycle arrest, the inhibition of BC cell proliferation, migration, metastasis, and angiogenesis. The progression of ER- $\alpha$  positive breast cancer is controlled by drugs like selective estrogen receptor modulators such as Tamoxifen. Long term therapy with Tamoxifen leads to resistance in body. Therefore, it is of interest to document the Molecular docking analysis of plant bioactives with ER-alpha. The work focuses on the docking of more than 20 selected plant bioactives against control in estrogen receptors to study the anti-breast cancer effects. The selected compounds were

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found to possess anticancer potential and could be considered as novel, cost-effective anticancer agents effective against ER positive breast cancer for further investigation.

Keywords: Breast cancer, Plant bioactives, Signaling pathways, Estrogen Receptor, (PI3K)

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### | 0482 | Development of Thermo-Responsive Hydrogel for Sustained Ocular Drug Delivery

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#### **ABSTRACT:**

The ocular route of drug administration presents unique challenges due to limited precorneal residence time, rapid nasolacrimal drainage, and low drug bioavailability. Conventional eye drops are often inadequate for sustained therapeutic effects. This research focuses on the development and characterization of a thermo-responsive hydrogel system that undergoes a sol-to-gel transition at physiological ocular surface temperature (~34–35°C), enabling prolonged retention and controlled drug release. In this study, Poloxamer 407 was selected as the primary thermo-sensitive polymer due to its well-established reverse thermal gelation properties. It was optimized in combination with Carbopol 934 and HPMC to enhance mucoadhesive strength and rheological stability. The hydrogel formulation was loaded with a model anti-fungal drug, and evaluated for critical parameters including gelation temperature, gel strength, clarity, pH, viscosity, and in-vitro drug release. FTIR and DSC analyses confirmed the compatibility and structural integrity of the drug within the polymer matrix. Rheological studies demonstrated non-Newtonian, pseudoplastic behaviour with a gelation temperature suitable for ocular application. Invitro drug release followed Higuchi kinetics, indicating diffusion-controlled release over a



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24-hour period. Ex-vivo permeation studies using goat cornea confirmed enhanced drug permeation compared to conventional eye drops. The formulation was found to be non-irritant. Stability studies under ICH guidelines demonstrated consistent performance over three months. This thermo-responsive in-situ hydrogel represents a promising non-invasive strategy for sustained ocular drug delivery, potentially improving patient compliance and therapeutic efficacy in chronic eye conditions such as uveitis and postoperative inflammation. Future studies will focus on in-vivo pharmacokinetics and potential translation into clinical use.

Keywords: Thermo-responsive hydrogel, ocular drug delivery, Poloxamer 407, Anti-Fungal Drug, sustained release, in-situ gel

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### | 0485 | Nanogels: A Promising Platform for Enhancing Drug Delivery

Shruti Rathore\*1

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#### **ABSTRACT:**

Nanogel is a nanosized crosslinked polymer-based particle. Nanogel generally made up of hydrogel which are crosslinked polymers. Hydrogels have unique property for the drug it provides network like structure. Nanogels are intersection of nanoparticles and hydrogels. Nanogel can be synthesized by different methods. Physical and chemical crosslinking methods are generally used. Hydrogels are polymers used for the preparation of nanogels. It may be obtained from natural source or synthesized in labs. Inversely, Synthetic polymers have defined structure, high stability and degradation of polymer is also controlled but it lacks of biological signals required for the biological cellular behaviour. Both natural and synthetic polymers have their own benefits and drawbacks. Polymers from natural origin like Chitosan, Pollulan, Cyclomylose, Glucan, Gelatin, Heparin, Polymers synthesized in laboratories are Polyethylene glycol and Polypeptides. Structure of the nanogel is depend on mechanism of synthesis and its application like Simple nanogels, Hollow nanogels, Core Shell, Hairy Nanogels, Multi-layered Nanogels. Properties of nanogels are tunable it can be designed to respond to various stimuli, such as pH, temperature, and light, allowing for controlled release of drugs, are biocompatible



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meaning they are well-tolerated by the body, surface can be modified to enhance their interaction with cells and tissues, it can improve the solubility and stability of drugs, making them more effective. In essence, nanogels are a promising platform for drug delivery, tissue engineering, and other biomedical applications due to their unique combination of size, structure, and properties.

Keywords: Nanogels, pH, Biocompatible, Nanoparticles, Light, Temperature

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