



LAKHMI CHAND INSTITUTE OF TECHNOLOGY

Bilaspur (C.G.)

AFFILIATED TO CSVTU & APPROVED BY AICTE



Conference Proceeding

1st INTERNATIONAL CONFERENCE

“ International Conference on Multidisciplinary Innovations in Engineering, Science, Humanities and Law ”

(ICMIESHL-2026) March 10th - 11th 2026

Organised By -

Department of Computer Science and Engineering

Supported By-

Chhattisgarh Society for Information Technology **CGSIT**



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Abstract Book



LAKHMI CHAND INSTITUTE OF TECHNOLOGY

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Department of Computer Science and Engineering

The Computer Science and Engineering (CSE) program at Lakmi Chand Institute of Technology is an integrated academic course that brings together the core principles of Computer Science and Computer Engineering. Established in 2008, the Department of Computer Science and Engineering is one of the earliest and most respected departments in the district. It features a team of highly experienced faculty members with strong industry and research backgrounds, and a committed group of students pursuing both undergraduate and postgraduate degrees. The department also actively participates in off-campus recruitment drives.

VISION :

The Department of Computer Science and Engineering envisions becoming a globally recognized hub of excellence in education, research, and innovation. Our goal is to cultivate technically proficient, industry-ready professionals and future leaders who contribute to the advancement of technology for societal and global benefit.

Foster a culture of academic excellence through a strong curriculum, cutting-edge research, and hands-on learning experiences. Develop skilled professionals who are adept at solving real-world challenges using emerging technologies such as Artificial Intelligence, Machine Learning, Cybersecurity, Cloud Computing, and the Internet of Things (IoT). Promote interdisciplinary research and innovation by encouraging collaboration between academia, industry, and research organizations.

MISSION :

The mission of the Department of Computer Science and Engineering is to provide high-quality education, foster innovation, and conduct impactful research to develop skilled professionals capable of addressing global technological challenges. Our mission is to:

1. **Deliver Excellence in Education** : Provide a robust and industry-relevant curriculum that equips students with strong theoretical foundations and hands-on technical skills in computing and emerging technologies.

2. **Promote Research and Innovation** : Encourage faculty and students to engage in cutting-edge research, interdisciplinary collaboration, and technological advancements that contribute to the growth of the industry and society.

3. **Enhance Industry Collaboration** Build strong partnerships with industries, research institutions, and professional organizations to ensure practical exposure, internships, and real-world project opportunities.

PREFACE

The 1st International Conference on Multidisciplinary Innovations in Engineering, Science, Humanities & Law (ICMIESHL-2026) is being organized by the Department of Computer Science & Engineering, Lakhmi Chand Institute of Technology (LCIT), Bilaspur (C.G.), India, on 10th–11th March 2026. The conference aims to provide a global platform for academicians, researchers, industry professionals, and students to share innovative research outcomes, exchange ideas, and discuss emerging trends across multiple disciplines.

In today's rapidly evolving world, complex challenges demand interdisciplinary approaches that integrate engineering, science, humanities, law, management, and industry practices. ICMIESHL-2026 is designed to encourage cross-disciplinary collaboration and foster meaningful dialogue among diverse research communities. The conference covers a broad range of themes, offering opportunities for participants to present original research, case studies, and practical innovations.

The conference proceedings include peer-reviewed papers selected for their originality, technical quality, and relevance. The organizing committee has made every effort to ensure a rigorous review process and high academic standards. The event is further enriched by keynote lectures delivered by eminent experts from academia and industry, providing valuable insights and perspectives to the participants.

We sincerely thank all authors, reviewers, keynote speakers, advisory members, and organizing committee members for their invaluable contributions and dedicated efforts. We also extend our gratitude to the management of LCIT for their constant support and encouragement.

We hope that ICMIESHL-2026 will serve as a meaningful forum for knowledge dissemination, research collaboration, and academic excellence, and that the deliberations and interactions during the conference will inspire future research and innovation.

The Department of Computer Science & Engineering is delighted to announce the International Conference on Multidisciplinary Innovations in Engineering, Science, Humanities and Law, a premier gathering dedicated to advancing knowledge through interdisciplinary collaboration. The conference is envisioned as a common platform for professionals and students from diverse backgrounds to share experiences and present

This international conference encourages cross-disciplinary collaboration, bringing together experts from various fields to explore innovative solutions. The event features keynote presentations, technical sessions, and workshops, providing a platform for researchers, students, and industry professionals to share their latest findings and insights. The conference is a unique opportunity for interdisciplinary collaboration, fostering a global network of researchers and practitioners. The event is a platform for sharing experiences and presenting research findings. The conference is a unique opportunity for interdisciplinary collaboration, fostering a global network of researchers and practitioners. The event is a platform for sharing experiences and presenting research findings.

In addition to the technical sessions, the conference will feature a series of workshops and seminars, providing a platform for researchers, students, and industry professionals to share their latest findings and insights. The conference is a unique opportunity for interdisciplinary collaboration, fostering a global network of researchers and practitioners. The event is a platform for sharing experiences and presenting research findings.

Overall, the conference aspires to contribute significantly to the advancement of knowledge and innovation by bridging gaps between theory and practice. By integrating perspectives from engineering, science, humanities and law, the event aims to inspire transformative research, inform policy and support the development of solutions that are ethically grounded, socially responsible and globally relevant.

***A global confluence of multidisciplinary ideas.
Where engineering, science, humanities,
and law collaborate.
Together shaping innovation
for a sustainable future.***





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Near High Court, Raipur Road, Bodri, Bilaspur, Chhattisgarh, India

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Message

Ideas beyond boundaries, innovation beyond disciplines.



It gives me immense pleasure to extend my warm greetings to all the delegates, researchers, academicians, industry professionals, and students participating in the 1st International Conference on Multidisciplinary Innovations in Engineering, Science, Humanities & Law (ICMIESHL-2026), being organized on 10th–11th March 2026 by the Department of Computer Science & Engineering, Lakhmi Chand Institute of Technology (LCIT), Bilaspur (C.G.), India.

In today's rapidly evolving global scenario, multidisciplinary research and innovation play a vital role in addressing complex societal, technological, and economic challenges. ICMIESHL-2026 aims to provide a vibrant international platform for the exchange of ideas, research findings, and innovative practices across diverse domains including engineering, science, humanities, law, management, and industry.

I firmly believe that this conference will foster meaningful interactions among researchers, academicians, and industry experts, encouraging collaborative research and promoting excellence in higher education and innovation. The presence of eminent keynote speakers and contributors from India and abroad will further enrich the academic value of this conference.

I appreciate the sincere efforts of the organizing committee, reviewers, advisory members, and all contributors who have worked tirelessly to make this conference a success. I also congratulate all authors and participants for their valuable contributions.

I wish the conference a grand success and hope that the deliberations during ICMIESHL-2026 will lead to fruitful outcomes, new research directions, and long-lasting academic collaborations.

With best wishes.

Shree Pramod Jain
Chairman
LCIT Group of Institution



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Message

Multidisciplinary minds shaping tomorrow.



It is with great pleasure that I extend my warm greetings and best wishes to all the distinguished delegates, academicians, researchers, industry professionals, and students participating in the 1st International Conference on Multidisciplinary Innovations in Engineering, Science, Humanities & Law (ICMIESHL-2026), scheduled on 10th–11th March 2026, organized by the Department of Computer Science & Engineering, Lakhmi Chand Institute of Technology (LCIT), Bilaspur (C.G.), India.

In the present era of rapid technological advancement and global transformation, interdisciplinary research has become essential for addressing complex real-world problems. This conference serves as a significant platform to bring together diverse perspectives from engineering, science, humanities, law, management, and industry, encouraging knowledge exchange and collaborative innovation.

I am confident that ICMIESHL-2026 will provide meaningful academic interactions, stimulate innovative thinking, and inspire young researchers to contribute effectively to society and nation-building. The participation of eminent keynote speakers and experts from academia and industry will further enhance the quality and impact of the conference deliberations.

I sincerely appreciate the dedicated efforts of the organizing committee, advisory board, reviewers, and volunteers for their commitment and hard work in organizing this prestigious event. I also extend my best wishes to all contributors and participants for a successful and enriching conference experience.

I wish the conference every success and hope it achieves its objective of fostering academic excellence, research integrity, and global collaboration.

With warm regards,

Shree Ankit Jain
Vice- Chairman



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Message

Confluence of engineering, science, humanities, and law.



It is with great pleasure that I extend my heartfelt greetings to all the eminent keynote speakers, academicians, researchers, industry professionals, and students participating in the 1st International Conference on Multidisciplinary Innovations in Engineering, Science, Humanities & Law (ICMIESHL-2026) scheduled on 10th–11th March 2026 at Lakhmi Chand Institute of Technology (LCIT), Bilaspur (C.G.), India.

In the present era of rapid global transformation, multidisciplinary research plays a pivotal role in addressing complex societal and technological challenges. This international conference provides an excellent platform for the exchange of innovative ideas, research findings, and best practices among scholars from diverse disciplines. Such academic initiatives significantly contribute to strengthening research culture and fostering global collaboration.

I commend the dedicated efforts of the organizing committee, faculty members, and supporting staff for their commitment to excellence in organizing this prestigious event. I am confident that the deliberations, keynote sessions, and technical interactions will be insightful and beneficial to all participants.

I wish the conference a grand success and hope that ICMIESHL-2026 achieves its vision of academic enrichment and meaningful knowledge dissemination.

With best wishes,

Mr. Upkar Rai
Secretary

Shree Shree Vidya Sagarji Maharaj Education Trust



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Message

One platform, many disciplines, shared innovation.



It gives me immense pleasure to extend my warm greetings to all the distinguished speakers, delegates, academicians, researchers, industry professionals, and students participating in the 1st International Conference on Multidisciplinary Innovations in Engineering, Science, Humanities & Law (ICMIESHL-2026), scheduled to be held on 10th–11th March 2026 at Lakhmi Chand Institute of Technology (LCIT), Bilaspur (C.G.), India.

In today's knowledge-driven era, interdisciplinary research and innovation play a crucial role in addressing emerging global challenges. This international conference provides an excellent platform for scholars and practitioners from diverse disciplines to exchange ideas, share research outcomes, and explore collaborative opportunities across engineering, science, humanities, law, management, and industry.

I strongly believe that ICMIESHL-2026 will promote academic excellence, encourage young researchers, and contribute significantly to the advancement of research culture. The presence of eminent keynote speakers and experts from academia and industry will undoubtedly enrich the deliberations and enhance the learning experience of all participants.

I sincerely appreciate the dedicated efforts of the organizing committee, reviewers, and supporting staff for their commitment to making this conference a grand success. I wish all participants a fruitful, engaging, and intellectually stimulating conference.

With best wishes,

Dr. G.K. Singh
Principal

Lakhmi Chand Institute of Technology, Bilaspur



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Message

Where disciplines unite to innovate the future.



It is a matter of great pride and pleasure to welcome all the distinguished keynote speakers, researchers, academicians, industry experts, and students to the 1st International Conference on Multidisciplinary Innovations in Engineering, Science, Humanities & Law (ICMIESHL-2026), being organized on 10th–11th March 2026 at Lakhmi Chand Institute of Technology (LCIT), Bilaspur (C.G.), India.

The rapid advancement of technology and knowledge demands a multidisciplinary approach to research and innovation. This conference aims to provide a vibrant platform for intellectual exchange, collaborative research, and the dissemination of innovative ideas across multiple domains. ICMIESHL-2026 will serve as a catalyst for nurturing creativity, critical thinking, and academic excellence among participants.

I appreciate the tireless efforts of the organizing committee, faculty members, and student volunteers for their dedication and professionalism in organizing this international event. I am confident that the technical sessions, keynote lectures, and research interactions will be highly informative and inspiring for all attendees.

I extend my best wishes to the conference and hope that ICMIESHL-2026 achieves its objectives and leaves a lasting impact on the academic and research community.

With warm regards,

Dr. Shubhi Shrivastava
Vice Principal

Lakhmi Chand Institute of Technology, Bilaspur



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Message

Diverse disciplines, one vision for innovation.



It is my great pleasure to welcome all the distinguished keynote speakers, academicians, researchers, industry professionals, and students to the 1st International Conference on Multidisciplinary Innovations in Engineering, Science, Humanities & Law (ICMIESHL-2026), scheduled to be held on 10th–11th March 2026 at Lakhmi Chand Institute of Technology (LCIT), Bilaspur (C.G.), India.

The Department of Computer Science & Engineering is proud to organize this international conference, which aims to provide a dynamic platform for sharing cutting-edge research, innovative ideas, and interdisciplinary perspectives. In today's rapidly evolving academic and industrial landscape, such forums are essential for fostering collaboration, encouraging young researchers, and bridging the gap between academia and industry.

I sincerely appreciate the efforts of the organizing committee, reviewers, faculty members, and student volunteers for their dedication and hard work in making this conference possible. I am confident that the keynote sessions, technical presentations, and scholarly interactions will be enriching and beneficial for all participants.

I wish the conference every success and hope that ICMIESHL-2026 serves as a meaningful step toward academic excellence and global research collaboration.

With warm regards,

Dr. Vishnu Kant Soni
Convener, International Conference
Head of Department CSE
Lakhmi Chand Institute of Technology, Bilaspur

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KEYNOTE SPEAKER



Dr. H. S. Hota

Professor

Head, Department of Computer Science & Applications,
Atal Bihari Vajpayee Vishwavidyalaya (ABVV), Bilaspur



Dr. Dilip Singh Sisodia

Associate Professor

National Institute of
Technology (NIT) Raipur



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ABOUT CONFERENCE

The 1st International Conference on Multidisciplinary Innovations in Engineering, Science, Humanities & Law (ICMIESHL-2026), organized by the Department of Computer Science & Engineering, Lakhmi Chand Institute of Technology (LCIT), Bilaspur (C.G.), India, on 10th–11th March 2026, aims to provide a global platform for academicians, researchers, industry professionals, and students to present original research, exchange innovative ideas, and discuss emerging trends across multiple disciplines. The conference encourages interdisciplinary collaboration, promotes academic excellence, and bridges the gap between academia and industry through keynote lectures, peer-reviewed paper presentations, and scholarly interactions, contributing to meaningful knowledge dissemination and research advancement.



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ABOUT LAKHMI CHAND INSTITUTE OF TECHNOLOGY

Lakhmi Chand Institute of Technology (LCIT), Bilaspur (Chhattisgarh), is a premier technical institution committed to excellence in higher education, research, and innovation. The institute offers quality undergraduate and postgraduate programs in engineering and allied disciplines, supported by experienced faculty, modern infrastructure, and a learner-centric academic environment. LCIT emphasizes holistic development through industry interaction, research activities, professional ethics, and skill-based learning, aiming to produce competent professionals who can contribute effectively to technological advancement and societal development.



ABOUT COMPUTER SCIENCE AND ENGINEERING DEPTT.

The Department of Computer Science & Engineering at Lakhmi Chand Institute of Technology (LCIT), Bilaspur (C.G.), is dedicated to providing high-quality education, research, and innovation in the field of computing. The department offers a strong academic curriculum supported by qualified faculty, well-equipped laboratories, and industry-oriented teaching–learning practices. It encourages students and researchers to engage in cutting-edge research, interdisciplinary projects, and professional development activities, with a focus on emerging technologies, ethical practices, and real-world problem solving, thereby preparing graduates to meet global technological and industrial challenges.

CONFERENCE TITLE

**International Conference on Multidisciplinary
Innovations in Engineering, Science, Humanities and Law**

ORGANIZED BY

**Department of Computer Science and Engineering
Lakhmi Chand Institute of Technology.**

SUPPORTED BY

**Chhattisgarh Society for Information Technology
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**Lakhmi Chand Institute of
Technology.**



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CONFERENCE TITLE

International Conference on Multidisciplinary Innovations in Engineering, Science, Humanities and Law

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Dr. Vishnu Kant Soni

HOD, CSE Department

Lakhmi Chand Institute of
Technology

CO-EDITORS



Dr. Amit Awasthi

Assistant Professor

Lakhmi Chand Institute of
Technology



Dr. Neetesh Kumar Nema

Assistant Professor

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1st INTERNATIONAL CONFERENCE

“ International Conference on Multidisciplinary Innovations in Engineering, Science, Humanities and Law ”

Organised By - **Department of Computer Science & Engineering**

(ICMIESHL-2026) March 10th - 11th 2026

DAY 1 – INAUGURAL & TECHNICAL SESSIONS

10:00 – 10:30 AM	Registration & Welcome Tea	Participants Registration and Tea
10:30 – 11:00 AM	Inaugural Ceremony	Lighting of Lamp & Saraswati Vandana
11:00 – 11:20 AM	Address by Convenor	Mr. Vishnukant Soni, Convenor, International Conference
11:20 – 11:40 AM	Address by Vice Principal	Mrs. Shubhi Shrivastava, Vice Principal, LCIT, Bilaspur
11:40 – 12:00 PM	Group Photographs	All Guests and Participants
12:00 – 01:00 PM	Invited Talk (Guest 1)	Prof. (Dr.) Dr. H. S. Hota, ABVV, Bilaspur
01:00 – 02:00 PM	LUNCH BREAK	
02:00 – 03:00 PM	Invited Talk (Guest 2)	Dr. Dilip Singh Sisodia, Associate Professor, NIT, Raipur
03:00 – 03:45 PM	Invited Talk (International Speaker)	Mr. Karthik Kambhampati, Staff Software Engineer, USA
03:45 – 04:00 PM	Tea Break & Networking	Informal Intraction with Speakers
04:00 – 05:00 PM	Students' Paper Presentation – Day 1	Selected Student Authors (Offline & Online) Track 1-4

DAY 2 – INVITED TALKS & VALEDICTORY SESSION

10:00 – 10:30 AM	Morning Tea & Recap of Day 1	Summary by Session Chair
10:30 – 11:30 AM	Invited Talk (Guest 1)	Dr. Rohit Raja, Associate Professor GGV, Bilaspur
11:40 – 01:00 PM	Invited Talk (Guest 2)	Dr. J.P. Patra, Associate Professor, CSVTU, Bhilai
01:00 – 02:00 PM	LUNCH BREAK	
02:00 – 04:00 PM	Students' Paper Presentation – Day 2	Selected Student Authors (Offline & Online) Track 1-4
04:00 – 05:00 PM	Valedictory & Certificate Distribution	Remarks by Organizing Convenor & Vote of Thanks

SUMMARY

Total Duration: 2 Days

Mode: Hybrid (Online + Offline)

Keynote Speakers: 4

Student Paper Presentations: 2 Sessions (Offline & Online)

Refreshments: Tea (Morning & Evening) + Lunch (01:00 PM – 02:00 PM)

Special Events: Inaugural, Panel Discussion, Valedictory

COORDINATOR

✉ Mr. Amit Awasthi
Assistant Professor
Department of Computer Science & Engineering

✉ Mr. Neetesh Kumar Nema
Assistant Professor
Department of Computer Science & Engineering



INDEX

Paper_ID	Paper Title	Author	Address	Page No.
ICMIESHL2026-101	Low-Code/No-Code Platforms: Impact On Software Development Productivity	James Christopher	SAP Specialist, KPMG, Norway	1
ICMIESHL2026-103	Edge Computing Applications For Real-Time Software Systems	Shrine Philips	SDP Coordinators SAP2, Canada Toronto	1
ICMIESHL2026-104	Impact Of Agile And Devops Practices On Software Delivery Performance In It Organizations	Saurabh Ghose	Quality Assurance Engineer, TCS United Kingdom, London	2
ICMIESHL2026-105	Log Analytics And Anomaly Detection In Large-Scale Software Systems	Suraj Arora	Software Consultant, Deloitte, Wellington, New Zealand	2
ICMIESHL2026-106	Analysis Of Data Privacy Compliance (Gdpr/Dpdp Act) In Software Products	Neeraj Nair	Automation Business Analyst, Manenir, Australia	3
ICMIESHL2026-107	Secure Software Development Lifecycle (Ssdlc): An Industry-Oriented Study	Rochit Barde	Sap Analyst, Wells Fargo Hartford, Connectioncut Unites States Of America	3
ICMIESHL2026-108	Cost Optimization Strategies In Cloud-Based Software Applications	Tushar Tiwari	Software Testing Manager, Deloitte, London, United Kingdom	4
ICMIESHL2026-109	Performance Optimization Techniques For Cloud-Native Microservices Architectures	Kishore Diwase	Digital Conyent Associate, LinkedIn, SouthKorea, Seoul	4
ICMIESHL2026-110	Container Security Challenges And Best Practices In Kubernetes Environments	Navoem Shrivastava	Professor, Department of Artificial Intelligence & Machantronics IIT Roorkee, Dubai Campus	5
ICMIESHL2026-111	Developer Productivity Measurement Using Engineering Analytics	Rahul Mukharjee	Data And Business Analytics Specialist, East London Business Alliance	5
ICMIESHL2026-112	AI-Powered Sustainable Development in India	Dr. Rajesh Shrivastava	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	6
ICMIESHL2026-113	Deep Learning Approaches in Image Processing: Techniques, Applications, And Challenges	Dr. S. Pavani, Dr. Kajal Kiran Gulhare	C M Dubey PG College, Bilaspur, India. Govt. E. Ragawendra Rao Science College, Bilaspur, India	6
ICMIESHL2026-114	Lightweight Attention-Based Scene Text Detection and Recognition For Real-Time Applications	Vishnu Kant Soni, Neetesh Kumar Nema, Priyanka Shukla, Muskan Naik	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India Guru Ghasidas Vishwavidyalaya, Bilaspur, India	7
ICMIESHL2026-115	An Intelligent Machine Learning Framework For Multi-Class ECG Arrhythmia Detection	Gaurav Kumar Jaiswal, Amit Awasthi	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	7
ICMIESHL2026-116	Optimizing Cyber-Physical Production Systems (CPPS): Synergizing Lean Methodology With IoT For Real-Time Waste Reduction	Ashish Paul, Neeti Sharma	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	8
ICMIESHL2026-117	Regulating Generative AI: Legal and Policy Frameworks	Priyanka Shukla, Vishnu Kant Soni, Neetesh Kumar Nema	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	8
ICMIESHL2026-118	Qualitative Analysis of Fruit Peel and its Elemental Detection by AAS	Dr. Jaishri Kaushik, Aarshiraza, Shriya Kesharwani	LCIT College of Commerce and Science, Bilaspur (C.G.)	9
ICMIESHL2026-119	Role of Proximate & Ultimate Analysis From Mine Site Extraction to Scientific Evaluation	Dr. Jaishri Kaushik, A. Shruti, Alisha Banjaree	LCIT College of Commerce and Science, Bilaspur (C.G.)	9
ICMIESHL2026-120	Adaptive Cognitive Digital Twins (ACDT) for Resilient Production Systems In Industry 5.0	Ayush Tiwari, Neeti Sharma	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	10
ICMIESHL2026-121	Optimizing Energy Conversion: The Role of Intelligent Mechatronics in Sustainable Power Generation	Ashutosh Kumar Jaiswal, Devendra Yadav	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	10
ICMIESHL2026-122	Experimental Investigation of Performance Enhancement in Heat Pipe–Based Evacuated Tube Solar Collectors	Shefali Thakur, Ashutosh Kumar Jaiswal	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	11
ICMIESHL2026-123	Smart Manufacturing and 3D Printing: How They Fit Together in Industry 4.0	Shefali Thakur , Kapil Kumar Pandey	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	11
ICMIESHL2026-124	A Study On AR/VR Based Gaming In Modern ERA	Diya Sharma, Fiza Parveen, Komal Giri	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	12



INDEX

Paper_ID	Paper Title	Author	Address	Page No.
ICMIESHL2026-125	Deep Learning For Automated American Sign Language Recognition: A CNN-Based Approach	Priya Tiwari, Tanishq Sharma, Abhinav Mishra, Neetesh Kumar Nema	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	12
ICMIESHL2026-126	Temporal And Structural Analysis of Information Cascading Behavior in Online Social Media Networks	Prapti Pandey, Dr. Vivek Shukla	Dr. C.V. Raman University, Kargi Road Kota Bilaspur C.G.	13
ICMIESHL2026-127	THD Reduction in A Five-Level Multilevel Inverter Using Optimized PWM Technique For Renewable Energy Applications	Deependra Rathore, Shweta Yadav	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	13
ICMIESHL2026-128	A Machine Learning-Driven Framework for Multi-Class ECG Arrhythmia Classification	Priyanka Kashyap, Amit Awasthi	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	14
ICMIESHL2026-129	AI-Oriented Robotic Nurse for Medical Support	Aditi Vastrakar, Nityaand Verma, Arpit Kumar Namdev	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	14
ICMIESHL2026-130	Velo: An IoT-Based Smart Cycle Sharing System For Sustainable Urban Mobility	Akhilesh Kushwaha, Ankit Sahu, Gaurav Soni, Navneet Kushwaha Savita Sahu	Government Engineering College, Bilaspur	15
ICMIESHL2026-131	Engineering Immersive Advertising Systems in the Indian Metaverse: System Architecture, AI-Driven Personalization, and Ethical Governance Framework	Priyanka Rajak, Prerna Rajak	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	15
ICMIESHL2026-132	Microclimate-Driven Fungal Succession in Discarded Vegetables: A Comparison of Sun-Exposed and Shaded Conditions	Prashant Sahu, Dr. Amit Sharma, Meetesh Kumar Nema	Dr. C.V. Raman University, Kargi Road Kota Bilaspur C.G.	16
ICMIESHL2026-133	A Focused Survey on Machine Learning and Hybrid Intelligent Methods in Wireless Sensor Networks	Ankita Kshatriya, Neetesh Kumar Nema	Guru Ghasidas Vishwavidyalaya, Bilaspur, India Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	16
ICMIESHL2026-134	Performance and Security Analysis of Blockchain Systems under Network, Consensus, and Resource Constraints	Yash Tiwari, Prateek Shrivastava, Swapnil Bhattacharya	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	17
ICMIESHL2026-135	Stock Market Price Prediction Using ML	Priyanshu Markndey, Vijay Singh, Stutui Choubey, Sakshi Netam	Government Engineering College Bilaspur (C.G.) , India	17
ICMIESHL2026-136	Bamboo-Reinforced Concrete Structural Elements: A Review	Vivek Pahuja, Ravindra Sharma Pradeep Kumar Ghose	CSVTU,UTD, Bhilai, Chhattisgarh, India Krishna Engineering College Bhilai Dr. C. V. Raman University Bilaspur Bhilai	18
ICMIESHL2026-137	Impact of Human Resource Accounting on Workforce Planning and Management in Fintech Companies of Chhattisgarh	Aanchal Sharma, Dr. Sumona Das	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	18
ICMIESHL2026-138	Explainable Multimodal Transformer Framework For Early Prediction of Diabetic Retinopathy Using Fundus Images and Clinical Metadata	Shubhi Shrivastava, Rahul Gedam Deependra Rathore	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	19
ICMIESHL2026-139	AI and Machine Learning in Advanced 3D Printing for Biomedical Engineering: Optimizing Bioprinting	Aryan Dev, Ashish Singh, Ramanuj Mishra	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	19
ICMIESHL2026-140	Machine Learning-Driven Mental Health Analytics: Current Techniques and Emerging Trends	Gourav Patel, Amit Awasthi	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	20
ICMIESHL2026-141	AI-Based Fraud Detection System for Online Transactions	M Nikhileshwari, Neetesh Kumar Nema	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	20
ICMIESHL2026-142	Simulation and Analysis for Solar Powered EV Charging Station Based on MPPT	Prashant Singh Rajpoot, Dr. Sanjay Kumar Singhai	Government Engineering College, Bilaspur DTE Raipur C.G.	21
ICMIESHL2026-143	Artificial Intelligence of Things (AIoT) for Smart Cities	Nazya Parveen, Anjali Sharma, Anchal Sondhiya	J.K Institute of Engineering, Bilaspur CSVTU Bhilai (C.G)	21
ICMIESHL2026-144	Attention-Based Convolutional Neural Networks For Glaucoma Prediction From Fundus Images	Deepika Bairagi, Dr. Rahul Gedam Dr. Deependra Rathore	Government Engineering College, Bilaspur Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	22



INDEX

Paper_ID	Paper Title	Author	Address	Page No.
ICMIESHL2026-145	A Cohesive Approach To Reliable AI: Risk Assessment, Generative Intelligence, and Governance Strategies	Nisha Saha, Kamesh Chandrakar	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	22
ICMIESHL2026-146	Grid Stability Prediction Using Machine Learning: A Comparative Study of Ensemble and Hybrid Models	Dr. Rahul Gedam, Komal Tiwari	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	23
ICMIESHL2026-147	Real-Time Power Quality Disturbance Classification Using Hybrid Deep Learning: A Case Study of The CSPDCL Smart Grid Infrastructure	Swati, Tamradhvaj	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	23
ICMIESHL2026-148	Reactive Power Compensation by Facts Device of Wind Energy Conversion System	Nirmal Panigrahi, Neha Vaishnav	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	24
ICMIESHL2026-149	Gender Neutrality in Workplace Harassment Laws: Balancing Equality and Protection	Anshika Vats, Deegansha Dixit	LCIT College of Commerce and Science, Bilaspur (C.G.)	24
ICMIESHL2026-150	Transition From Indian Penal Code To Bharatiya Nyaya Sanhita: A Critical Analysis	Dr. Arjun Singh Chauhan, Manish Sinha, Aditya Pratap Singh	LCIT College of Commerce and Science, Bilaspur C.G. India	25
ICMIESHL2026-151	Impact of AI-Powered Automation on News Gathering and Content Creation	Ajay Kumar Chauhan, Amit Awasthi	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	25
ICMIESHL2026-152	Digital Technology in Education: Implications For Teaching Practices, Student Learning, and Policy Perspectives	Dr. Nikita Vidhani, Akash Ranjan Panda, Sanjana Mitra	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India Guru Ghasidas Vishwavidyalaya, Bilaspur	26
ICMIESHL2026-153	Machine Learning Techniques For Feature Extraction and Selection For Image Recognition	Akshita Mishra, Neetesh Kumar Nema	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	26
ICMIESHL2026-154	Self-Healing Distributed File System with AI Optimization.(Resilify)	Aashutosh Garg, Vaibhav Sharma, Sonia Wadhwa	Government Engineering College, Bilaspur, Chhattisgarh, India	27
ICMIESHL2026-155	Kinematic Design of A Ligature-Actuated Morphing Wing For Tube-Launched Unmanned Aerial Vehicles	Chandraprakash Karnik, Ashish Paul, Avinash Singh	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	27
ICMIESHL2026-156	Reduction of Carbon Footprint in Production Systems Using Lean Tools	Avinash Singh, Ashim Mukherjee	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	28
ICMIESHL2026-157	Assessment of Storage and Market-Associated Fungal Flora in Millet Grains: Implications For Food Safety and Public Health	Meetesh Kumar Nema, Dr. Amit Sharma, Prashant Sahu	Dr. C.V. Raman University, Bilaspur C.G.	28
ICMIESHL2026-158	A Scalable Deep Neural Architecture For Rumor And Non-Rumor Classification in Large-Scale Social Media Systems	Abhishek Kesharwani, Dr. Samarendra Mohan Ghosh, Mr. Shiv Shankar Gupta	Dr. C. V. Raman University, Bilaspur (C.G.), India LCIT College of Commerce & Science, Bilaspur (C.G.)	29
ICMIESHL2026-159	Approximation of Function in The Holder Metric By Product Means of Fourier Series	Santosh Kumar Sinha, Pragya Sharma	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India G.H.S.S. Kudekela, Dharamjaigarh Raigarh Chhattisgarh	29
ICMIESHL2026-160	Cross-Cultural Management and Leadership Effectiveness	Rupali Sharma, Dr. Satish Sahu	Dr. C. V. Raman University, Bilaspur (C.G.), India	30
ICMIESHL2026-161	A Case Study on Solid-Waste Management in Bilaspur City, Chhattisgarh	Vidit Kosariya, Bhumika Das, Namrata Singh	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	30
ICMIESHL2026-162	Sewage Sludge Management Challenges in Bilaspur, Chhattisgarh	Aakash Tirkey, Bhumika Das, Namrata Singh	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	31
ICMIESHL2026-163	Sustainable Urban Habitats and Urban Water Supply: A Case Study of Bengaluru City, India	Aditi Singh, Bhumika Das, Namrata Singh	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	31
ICMIESHL2026-164	Greywater Treatment and Reuse For Sustainable Water Management in Bilaspur Chhattisgarh	Akanksha Sahu, Bhumika Das, Namrata Singh	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	32
ICMIESHL2026-165	An Impact of Industrial Effluents on Groundwater Quality of Siltara Industrial Area, Raipur, (C.G)	Indrajeet, Bhumika Das, Namrata Singh	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	32
ICMIESHL2026-166	Fluoride Risk Assessment and Management Strategies For Drinking Water in Janjgir–Champa, District, Chhattisgarh	Rajesh Kumar Divya, Bhumika Das, Namrata Singh	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	33



INDEX

Paper_ID	Paper Title	Author	Address	Page No.
ICMIESHL2026-167	Ethical Implications of Deepfake Image Generation and Detection	Vaibhav Awasthi, Neetesh Kumar Nema, Vishnu Kant Soni	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	33
ICMIESHL2026-168	The Influence of Social Media Advertising on Impulsive and Compulsive Buying Behavior Among Generation Z Consumers in India's Apparel Industry	Ms. Tripti Majumdar, Dr. Hemant Kumar	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	34
ICMIESHL2026-169	Brain Stroke Prediction Using Machine Learning Algorithms	Muskan Siddiqui, Rajendra Soni	Shri Agrasen Kanya Mahavidyalaya Korba, India	34
ICMIESHL2026-170	From Cultural Heritage To Legal Rights: A Critical and Comparative analysis of Traditional Cultural Expression in Chhattisgarh	Sonali Mishra, Priyanka Navlani, Shristi Sirwani	LCIT College of Commerce and Science, Bodri, Bilaspur, Chhattisgarh	35
ICMIESHL2026-171	Assessment of Physico Chemical Parameters of Treated Water	Ayushi Roy, Tanay Namdeo, Sumitra Joshi	LCIT College of Commerce and Science, Bodri, Bilaspur, Chhattisgarh	35
ICMIESHL2026-172	Support Vector Machine-Based Intrusion Detection Systems: A Comprehensive Survey on Kernel Functions and Optimization Strategies	Rakesh Rajput, Dr. Devendra Kumar Singh	GGV (Central University) Bilaspur, CG, India	36
ICMIESHL2026-173	Enhancing User Experience in Human – Computer Interaction (HCI) Using Intelligent and Adaptive Interfaces	Ahana Sharma, Sakshi Thakur, Mitali Verma, Kusmita Mandavi	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	36
ICMIESHL2026-174	A Machine Learning – Vision Surgical Assistance Health Care And Biomedical (Robotics + Machine Learning)	Shahil Gupta, Atul Prayga Kerketta, Aditya Gupta, Shubham Thaku	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	37
ICMIESHL2026-175	Forecasting Iron Ore Prices Using Hybrid Ensemble Models: A Deep Learning Approach	Aditi Mehra, Dr Kapil Kumar Nagwanshi	Guru Ghasidas Vishwavidyalaya, Bilaspur, India	37
ICMIESHL2026-176	Role of Humanities in Sustainable Development	Dr. Anjali Harangaonker	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	38
ICMIESHL2026-177	Bitcoin: Architecture, Security, Scalability and Economic Impact	Mahi Soni, Akshay Kashyap, Geetanshu Kashyap	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	38
ICMIESHL2026-178	Design and Development of Low-Cost Neuromorphic Computing Systems For Brain-Computer Interfaces	Prakash Kaushik, Devshree Sannadya, Akshita Chandel, Himanshi Yadav	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	39
ICMIESHL2026-179	Automated Lung Nodule Detection In CT Scans Using Methods and Techniques	Deepak Jaiswal, K. Akshit, Rahul Pal	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	39
ICMIESHL2026-180	Approximation of Almost Lipschitz Function By Means of Conjugate Fourier Series	Santosh Kumar Sinha Deepti Thawait	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	40
ICMIESHL2026-181	Trend Prediction Using Social Media Data Analytics	Anvesh Pandey, Nilesh Gupta	Chouksey Engineering College, Bilaspur, C.G., India	40
ICMIESHL2026-182	AI Product ads Generator	Ishana Begum, Tikesh Dhruw, Suhana Pathak, Neetesh Kumar Nema	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	41
ICMIESHL2026-183	Coal Overburden Used in The Construction Industry For Sustainable Development: A Review	Priya Mishra , Ashish Vivek Sukh, Upesh Kashyap, Abhay Singh	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	41
ICMIESHL2026-184	Cyber Security Approaches To Prevent Malware and Virus Attacks	Tanuja Sahu	Guru Ghasidas Central University Bilaspur Chhattisgarh	42
ICMIESHL2026-185	Enhancement of Bioavailability of Poorly Water-Soluble Drugs Using Nanotechnology-Based Drug Delivery Systems	Devashish Dubey	LCIT College of Pharmacy, CSVTU, India	42
ICMIESHL2026-186	Clinical trial ethics: A humanistic viewpoint on informed consent and patient rights	Ayush Kesharwani Gupta, Sushmita Verma Jeevan Lal Prajapati	LCIT College of Pharmacy, CSVTU, India	43
ICMIESHL2026-187	AI-Driven Cross-Platform Recommendation Through User Behavior and Trend Analysis	Aditya Sahu, Tanisha Singh, B.Vaishnavi	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	43



INDEX

Paper_ID	Paper Title	Author	Address	Page No.
ICMIESHL2026-188	Assessment of Physico-Chemical Characteristics and Water Quality Index of Water Resources in Bilaspur District, Chhattisgarh	Ms. Kareena Patel, Nobel Kumar Kashyap	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	44
ICMIESHL2026-189	Machine Learning–Based Predictive Maintenance of Transformers	Abhishek Kaushik, Jyoti Nishad, Om Mishra	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	44
ICMIESHL2026-190	Cattle Intrusion Detection for Enhanced Road Safety and Surveillance by using Deep Learning	Bharti Barde, Shivangi Pandey, Rajeev Lochan Sharma	LCIT College of Commerce and Science, Bilaspur, C.G.	45
ICMIESHL2026-191	Collection Development and Management	Asha Sao	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	45
ICMIESHL2026-192	EVA: A Scalable Low-Cost Sensor-Based Smart Irrigation Architecture for Rural India	Bharat Yadav, Isha Patkar	DP Vipra College, Bilaspur, Chhattisgarh, India	46
ICMIESHL2026-193	Recent Advances in Herbal Immuno modulators: Mechanisms and Clinical Implications	Sweta Sinha, Janita Sahu Anima Biswas	LCIT College of Pharmacy Bilaspur, C.G. India	46
ICMIESHL2026-194	Seismic Analysis and Performance Evaluation of Bridges in Earthquake	Pushp Lakshmi Rao	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	47
ICMIESHL2026-195	Acute Behavioural and Morphological Alterations Induced by Deltamethrin Exposure in Labeo Rohita	Vailankanni Joseph, Ayushi Sahu, Pavan Kumar Sheena Farheen Khan	LCIT College of Commerce and Science, Bodri, Bilaspur, Chhattisgarh	47
ICMIESHL2026-196	Assessment of Behavioural Alterations in Labeo Rohita Exposed to Household Detergent	Khushi Gupta, Sonali Gupta, Navaldas Suryawanshi, Saujanya Tiwari	LCIT College of Commerce and Science, Bodri, Bilaspur, Chhattisgarh	48
ICMIESHL2026-197	Solid Lipid Nanoparticles (SLNs) for Controlled Drug Delivery: Formulation Strategies, Characterization, Route-Specific Applications, and Future Perspectives	Mahima Trivedi, Dr. Prof. M. K. Gupta	Department of Pharmacy, CPU, Kota, Rajasthan	48
ICMIESHL2026-198	Renewable Energy Integration in Smart Grid	Riya Das, Khushbu Gupta, Thameesha Sharma	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	49
ICMIESHL2026-199	Power Quality Improvement Using Shunt Active Power Filter	Ritesh Yadav, Rahul Kashyap, Vineet Sahu	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	49
ICMIESHL2026-200	Explainable AI For Digital Forensic Evidence Analysis	Dershana Jain, Hasti Dholu, Naina Jaiswal	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	50
ICMIESHL2026-201	Comprehensive Analysis of Loss Mechanisms in Electric Vehicle Power Converters and Inverters	Manharan, Khem Chand Sahu, Abhay Rathore	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	50
ICMIESHL2026-202	A Multi-Layered AI System For Detecting Coordinated Influence and Inauthentic Behavior in Social Media	Ayushman Jangde, Mahima Kashyap, Palak Kaiwart	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	51
ICMIESHL2026-203	Real-Time Environmental Improvisation and Psycho-Adaptive Game AI: Beyond Scripted Behavior and Mimicry	Sarthak Verma, Payal Mishra	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	51
ICMIESHL2026-204	AI Mock Interview	Akshay Kumar Sahu, Safiya Fatima, Nitya Rathod, Rupesh Kumar, Vaibhav Awasthi	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	52
ICMIESHL2026-205	Nexai : A Full Stack AI SAAS Application Using The Pern Stack	Dhairya Kaushik, Jay Kumar, Anjar Alam, Ashu Singh, Priyanka Shukla	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	52
ICMIESHL2026-206	Automation of Examination Seating Plan Using Flask and Sqliite : Wearrange	Kreetika Thakur, Damini Tiwari, Priyanka Rajak	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	53



INDEX

Paper_ID	Paper Title	Author	Address	Page No.
ICMIESHL2026-207	BT-Based Metal Detector Robot With Voice Response	Aakriti Mishra, Ajay Raj Sahu, Vasudha Kshatri, Sayad Miraj Ali, Dr. Amit Awasthi	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	53
ICMIESHL2026-208	Email Spam Detection Using Machine Learning	Pranay Soni, Nandani Prajapati, Ritik Mishra, Shaikh Sohel, Mrs. Priyanka Shukla	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	54
ICMIESHL2026-209	Everaura: A Real-Life Web-Based Jewellery Store Using Localstorage and Whatsapp order Processing	Aakriti Kotwani, Harsh Naik, Dipika Raj, Deepti Singh, Neetesh Kumar Nema	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	54
ICMIESHL2026-210	Fake News Detection Using Machine Learning	Shruti Mishra, Smidha Rawani, Mousmi Singh, Vishnu Kant Soni	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	55
ICMIESHL2026-211	Design and Development of A Java-Based, Technology-Enhanced Mobile Fitness Management System for Health Monitoring	Payal Kashyap, Tashu Vishwakarma, Nitesh Jaiswal, Pranjal Sahu, Priyanka Rajak	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	55
ICMIESHL2026-212	Info AI Chat-Bot	Afreen Jahan, Divya Gupta, Harsh Thawait, Anvesh Pandey	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	56
ICMIESHL2026-213	A Lightweight IoT Deception Framework: ESP8266-Based Evil Twin HoneyPot For Real-Time Device Fingerprinting And Attack Analytics	Shreya Kshatri, Vishnu Kant Soni	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	56
ICMIESHL2026-214	Say It! With A Straight Face: Real-Time Emotion Detection And Speech Recognition For An Interactive Web-Based "Poker Face" Challenge	Harshit Kumar Sahu, Vishnu Kant Soni Dr. S. R. Tandan	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	57
ICMIESHL2026-215	Skill Swap (A Peer-To-Peer Skill Exchange Platform)	Ayush Yadav, Anubhav Chandra, Pralok Rathore, Neetesh Kumar Nema	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	57
ICMIESHL2026-216	Deepfake Image Detection Using AI With Self-Supervised Learning	Deep Ghosh, Kaleshwari Rajwade, Tanvi Kumari, Vikas Rathore, Amit Awasthi	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	58
ICMIESHL2026-217	Attendvision: A-I Powered Virtual Assistant For Intelligent And Secure Voice-Controlled Automation	Kunal Kumar Mandal, Ashish Sharma, Akash Patel	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	58
ICMIESHL2026-218	Campusbot: AI Helpdesk Assistant	Sadbhaw Kaiwartya, Nihal Bhagat, Santeshwar Sahu, Priyanka Farwi, Priyanka Rajak	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	59
ICMIESHL2026-219	Campussutra: A High-Performance Centralized Digital Platform For Campus Event Management and Archival Using Next.js	Suraj Pratap Singh, Harmesh Varma, Ghanraj Chandra, Danish Patel	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	59
ICMIESHL2026-220	Building Smarter Lexicons: Developing A Dictionary Chatbot For Seamless Language Understanding	Adhikarala Sankalp, Chanchal Sahu, Mehak Jahangir, Prabhanshu Shukla	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	60
ICMIESHL2026-221	Driver Drowsiness Detection System	Sunny Mehar, Vivek Pradhan	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	60



INDEX

Paper_ID	Paper Title	Author	Address	Page No.
ICMIESHL2026-222	Event Management System	Vaibhav Jaiswal, Monish Dutt Kaushik, Shriyansh Keshary	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	61
ICMIESHL2026-223	Explainable Text Creation: Combining Neronpedia With Gpt-2 For Clear AI Recommendations	Aditi Shreya, Aditya Mure, Anuj Choudhary, Anurag Yadav, Anvesh Pandey	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	61
ICMIESHL2026-224	PDF Summarizer Using Python	Sparsh Dubey, Krutika Pohre, Ankita Das, G.Chaitanya, Neetesh Kumar Nema	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	62
ICMIESHL2026-225	Attendvision: Machine Learning-Based Face Recognition With Liveness Detection For Attendance Automation	Hariom Singh, Prayag Nishad	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	62
ICMIESHL2026-226	Quick GPT: An Intelligent Conversational AI System with Integrated Image Generation Capabilities	Shwet Prakash, Subham Kumar Khunte	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	63
ICMIESHL2026-227	Fake News Detection Using Neural Network	Anamika Prasad, Aditya Gupta, Akhilesh Singh, Pinky Kashyap	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	63
ICMIESHL2026-228	Sentica-Youtube Comment Sentiment Analyzer	Abhishek Singh Rajput, Anivesh Samuel Khalkho, Anmolika Pathak, Sanskriti Gupta Priyanka Shukla	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	64
ICMIESHL2026-229	Fake News Detection Using NLP	Amit Awasthi, Harsh Kumar Karosiya, Geetika Mahakud, Divya Sen, Anutosh Kumar Rajak	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	64
ICMIESHL2026-230	Student Performance Prediction System Using ML And Stream LIT Interface	Divyansh Soni, Ayushman Jaiswal, A Nitin Kumar, Mr. Amit Awasthi	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	65
ICMIESHL2026-231	Tech-Seva: A Unified Platform For Machine Learning-Based Real-World Solutions	Sahil Ghora, Ravina Yadav, Raman Sahu, Vedant Vishwakarma, Neetesh Kumar Nema	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	65
ICMIESHL2026-232	Exploratory Data Analysis	Vaibhav Singh, Neetesh Kumar Nema, Anvesh Pandey	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	66
ICMIESHL2026-233	Town Administration Complaint Portal	Khushi Isha, Sanskar Singh Thakur, Akshit Vaishnav, Prachi Sai, Neetesh Kumar Nema	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	66
ICMIESHL2026-234	Travel Allowance Portal: A Web-Based System For Efficient Travel Claim Automation	Sujal Bhandarwar, Nimanyu Singh, Rounak Soni Harsh Choubey	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	67
ICMIESHL2026-235	Pronunciation Evaluator System	Tanisha Soni, Paridhi Mishra, Sujit Sharma, Kamal Kumar Sahu, Priyanka Shukla	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	67
ICMIESHL2026-236	Selfie-Based Event Photo Finder	Mohammad Nazil, Palak Singh, Rakesh Bidoya, Neelima Vastrakar	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	68



International Conference on Multidisciplinary Innovations in Engineering, Science, Humanities and Law



ABSTRACT

ICMIESHL2026-238	Preliminary phytochemical screening of leaves of <i>Hedyotis corymbosa</i> (L.)	Rashmi Sharma, Aakanksha Sharma, Rubi Vishwakarma, Manish Dubey	LCIT College of Commerce and Science, Bodri, Bilaspur (C.G.)	68
ICMIESHL2026-240	Impact of Gig-Labor Operations on Service Quality	Ms. Yashvi Sharma Ms. Tulsi Soni	LCIT College of Commerce and Science, Bodri, Bilaspur (C.G.)	69
ICMIESHL2026-241	Investment strategy in Emerging Economies	Kiran kaur Rana, Mr. Ram Ratan Mishra	LCIT College of Commerce and Science, Bodri, Bilaspur, Chhattisgarh, India	69
ICMIESHL2026-242	Impact of online Consumer Reviews on Purchase Behavior: A Sentiment-Based Perception Study	Shreyansh Tiwari, Harsha Tiwari	LCIT College of Commerce and Science, Bodri, Bilaspur (C.G.)	70
ICMIESHL2026-243	Impact of Social Media Reviews on Brand Perception: A Data Mining Study	Shekh Aadil Dalla, Vantika Shrivastava	LCIT College of Commerce and Science, Bodri, Bilaspur (C.G.)	70
ICMIESHL2026-244	Digital Dividends or Digital Divides? Assessing Equitable Access To Modern Banking Services	Dr. Anuj Bajpai, Dr. Shadiya Khanam Ali	LCIT College of Commerce and Science, Bodri, Bilaspur (C.G.)	71
ICMIESHL2026-245	Service Complain Management Portal	Ashish Kumar Yadav, Aditya Bhargav, Aanya Gupta, Ansh Soni, Vishnu Kant Soni	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	71
ICMIESHL2026-246	Solar-Powered Smart Helmet with Safety and Bluetooth Features	S. Venkatesh, Kovid Chauhan, Aadarsh Ojha, Pranjali Soni, Amit Awasthi	Lakhmi Chand Institute of Technology, Bilaspur, Chhattisgarh, India	72
ICMIESHL2026-248	Assessment of Weed Management Practices and Their Impact on Crop Yield in Dry Seeded Rice Fields in Mungeli District , Chhattisgarh, India	Dr. Mantosh Kumar Sinha Tribhuvan Nishad	Chouksey College of Science and Commerce, Bilaspur (Chhattisgarh), India Research Scholar, Chouksey College of Science and Commerce, Bilaspur	72
ICMIESHL2026-249	Design and Evaluation of Effervescent Buccal Fentanyl Tablets for Rapid Relief of Breakthrough Pain	Deepesh Lall	Department of Pharmaceutics, LCIT School of Pharmacy, Bilaspur, Chhattisgarh	73
ICMIESHL2026-250	Hybrid Smote-PCA Stacked Ensemble Model For Early Diabetes Prediction	Palak Joshi, Gargee Shukla, Dr. Anamika Shukla Sharma	Government E.R.Rao PG Science College, Bilaspur (CG), Government Bilasa Girls' PG Autonomous College, Bilaspur (CG), Government E.R.Rao PG Science College, Bilaspur (CG),	74

ABSTRACT OF PAPERS



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LOW-CODE/NO-CODE PLATFORMS: IMPACT ON SOFTWARE DEVELOPMENT PRODUCTIVITY

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The increasing demand for rapid application development and digital transformation has accelerated the adoption of low-code and no-code (LCNC) platforms within software organizations. This study examines the impact of low-code/no-code platforms on software development productivity, focusing on their ability to reduce development time, lower technical complexity, and enable greater participation from non-technical users. The research evaluates how LCNC platforms influence key productivity indicators such as development speed, maintenance effort, cost efficiency, and collaboration between business and IT teams. Using an industry-oriented methodology, data is gathered through case studies, surveys, and performance comparisons between traditional development approaches and LCNC-based solutions. The findings indicate that low-code/no-code platforms significantly enhance productivity for standard and workflow-driven applications, while presenting limitations related to customization, scalability, and long-term maintainability. The study highlights best practices for integrating LCNC platforms into existing software development ecosystems and provides guidance for organizations seeking to balance rapid delivery with software quality and governance.

Keywords: *Low-Code Platforms, No-Code Platforms, Software Development Productivity, Rapid Application Development, Digital Transformation, Citizen Developers, Software Engineering, Application Lifecycle Management.*

EDGE COMPUTING APPLICATIONS FOR REAL-TIME SOFTWARE SYSTEMS

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The growing demand for low-latency and real-time data processing has driven the adoption of edge computing as a complementary paradigm to centralized cloud architectures. This study explores edge computing applications for real-time software systems, focusing on how computation and data processing closer to data sources can enhance system responsiveness, reliability, and scalability. The research examines key application domains such as Internet of Things (IoT), smart cities, industrial automation, healthcare monitoring, and autonomous systems, where real-time decision-making is critical. Using an industry-oriented approach, the study analyzes architectural models, communication protocols, and deployment strategies that enable efficient edge-based processing. The findings demonstrate that edge computing significantly reduces network latency, bandwidth usage, and dependency on cloud connectivity, while improving fault tolerance and quality of service in real-time software systems. The study also discusses challenges related to security, resource constraints, and orchestration across edge-cloud environments, providing practical insights for software engineers and architects designing next-generation real-time applications.

Keywords: *Edge Computing, Real-Time Software Systems, Low-Latency Processing, Internet of Things (IoT), Distributed Systems, Edge-Cloud Architecture, Scalability, Software Architecture.*



ABSTRACT

IMPACT OF AGILE AND DEVOPS PRACTICES ON SOFTWARE DELIVERY PERFORMANCE IN IT ORGANIZATIONS

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In today's competitive and fast-paced IT environment, organizations are under constant pressure to deliver high-quality software rapidly and reliably. Agile and DevOps practices have emerged as key enablers for improving software delivery performance by fostering collaboration, automation, and continuous improvement across development and operations teams. This study examines the impact of Agile and DevOps practices on software delivery performance in IT organizations, focusing on metrics such as deployment frequency, lead time, change failure rate, and mean time to recovery. Using an empirical approach, the research analyzes data collected from software professionals across multiple IT organizations through surveys, interviews, and project performance records. The findings indicate that the adoption of Agile methodologies combined with DevOps practices significantly enhances delivery speed, product quality, and team productivity while reducing operational risks and post-release defects. The study also highlights critical success factors, including organizational culture, toolchain integration, and management support, that influence the effectiveness of Agile-DevOps adoption. The results provide valuable insights for industry professionals and decision-makers seeking to optimize software delivery performance and achieve sustainable competitive advantage through modern software engineering practices.

Keywords: *Agile Methodology, DevOps Practices, Software Delivery Performance, Continuous Integration, Continuous Deployment, IT Organizations, Software Quality, Productivity, DevOps Automation*

LOG ANALYTICS AND ANOMALY DETECTION IN LARGE-SCALE SOFTWARE SYSTEMS

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Large-scale software systems generate massive volumes of log data that capture critical information about system behavior, performance, and failures. Effective log analytics plays a vital role in monitoring system health and ensuring reliability in complex, distributed environments. This research focuses on log analytics and anomaly detection in large-scale software systems, aiming to identify abnormal patterns that indicate potential faults, security threats, or performance degradation. The study employs a combination of statistical techniques, machine learning, and time-series analysis to process and analyze structured and unstructured log data collected from production systems. Experimental results demonstrate that automated anomaly detection significantly improves early fault detection, reduces mean time to recovery, and enhances overall system reliability compared to traditional rule-based monitoring approaches. The research further discusses challenges such as log heterogeneity, scalability, and noise, and proposes best practices for implementing efficient log analytics pipelines in enterprise environments. The findings provide practical insights for software engineers and IT organizations seeking to improve observability, resilience, and operational efficiency in large-scale software systems.

Keywords: *Log Analytics, Anomaly Detection, Large-Scale Software Systems, Distributed Systems, Machine Learning, System Monitoring, Fault Detection, Observability, Software Reliability*



ABSTRACT

ANALYSIS OF DATA PRIVACY COMPLIANCE (GDPR/DPDP ACT) IN SOFTWARE PRODUCTS

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With the rapid growth of digital platforms and data-driven software products, ensuring compliance with data privacy regulations has become a critical concern for software organizations. This study presents an analysis of data privacy compliance in software products with reference to the General Data Protection Regulation (GDPR) and India's Digital Personal Data Protection (DPDP) Act. The research evaluates how software products collect, process, store, and share personal data, and assesses their alignment with key regulatory principles such as lawfulness, consent management, data minimization, purpose limitation, user rights, and data security safeguards. Using a qualitative and quantitative approach, the study analyzes privacy policies, system architectures, and implementation practices across selected software products, supported by surveys and interviews with industry professionals. The findings reveal common compliance gaps related to consent mechanisms, data retention policies, and breach notification procedures, particularly in rapidly evolving agile development environments. The study also highlights best practices and technical measures that can help organizations achieve regulatory compliance while maintaining system performance and user trust. The results provide practical guidance for software engineers, architects, and compliance teams aiming to embed privacy-by-design and privacy-by-default principles into modern software products.

Keywords: *Data Privacy Compliance, GDPR, DPDP Act, Software Products, Privacy-by-Design, Personal Data Protection, Regulatory Compliance, Information Security, User Consent.*

SECURE SOFTWARE DEVELOPMENT LIFECYCLE (SSDLC): AN INDUSTRY-ORIENTED STUDY

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In an era of increasing cyber threats and regulatory requirements, integrating security throughout the software development process has become a critical necessity for IT organizations. This study presents an industry-oriented analysis of the Secure Software Development Lifecycle (SSDLC), focusing on how security practices can be systematically embedded into each phase of the traditional Software Development Lifecycle (SDLC). The research examines real-world adoption of SSDLC practices such as secure requirements engineering, threat modeling, secure coding standards, automated security testing, vulnerability assessment, and secure deployment. Using empirical data collected through surveys, interviews with industry professionals, and case studies from software organizations, the study evaluates the impact of SSDLC adoption on software quality, risk reduction, and compliance readiness. The findings indicate that organizations implementing SSDLC experience a significant reduction in security vulnerabilities, improved incident response, and enhanced customer trust, despite challenges related to skill gaps, tool integration, and development timelines. The study provides practical insights and recommendations for software companies seeking to balance security, agility, and productivity in modern development environments.

Keywords: *Secure Software Development Lifecycle, SSDLC, Software Security, Secure Coding Practices, Vulnerability Management, DevSecOps, Industry Practices, Risk Mitigation, Software Quality.*



COST OPTIMIZATION STRATEGIES IN CLOUD-BASED SOFTWARE APPLICATIONS

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The widespread adoption of cloud computing has enabled software organizations to achieve scalability, flexibility, and rapid deployment of applications; however, uncontrolled cloud resource usage often leads to escalating operational costs. This study investigates cost optimization strategies in cloud-based software applications, with a focus on identifying practical techniques that balance performance, scalability, and financial efficiency. The research examines key cost drivers such as compute, storage, networking, and managed services, and analyzes optimization approaches including resource right-sizing, auto-scaling, containerization, serverless computing, and effective monitoring practices. Using an industry-oriented methodology, data is collected from real-world cloud deployments, cost reports, and surveys of software professionals. The findings demonstrate that systematic cost optimization strategies can significantly reduce cloud expenditure while maintaining application performance and reliability. The study also highlights challenges related to cost visibility, architectural complexity, and organizational awareness, and proposes best practices for implementing continuous cost governance (FinOps) in cloud environments. The results provide actionable insights for software engineers, architects, and decision-makers seeking to maximize the value of cloud investments.

Keywords: *Cloud Cost Optimization, Cloud Computing, Software Applications, FinOps, Resource Right-Sizing, Auto-Scaling, Serverless Computing, Cost Governance, Cloud Architecture.*

PERFORMANCE OPTIMIZATION TECHNIQUES FOR CLOUD-NATIVE MICROSERVICES ARCHITECTURES

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Cloud-native microservices architectures have become the backbone of modern software applications due to their scalability, flexibility, and resilience. However, the distributed nature of microservices introduces significant performance challenges, including network latency, service communication overhead, resource contention, and observability complexity. This study explores performance optimization techniques for cloud-native microservices architectures, focusing on practical, industry-oriented approaches to enhance system efficiency and reliability. The research analyzes optimization strategies such as efficient service decomposition, API gateway and service mesh utilization, container resource tuning, intelligent load balancing, caching mechanisms, and asynchronous communication patterns. Empirical data is collected from real-world cloud deployments, performance benchmarks, and industry case studies. The findings demonstrate that the adoption of targeted optimization techniques leads to measurable improvements in response time, throughput, and resource utilization while maintaining system scalability and fault tolerance. The study also discusses key challenges related to monitoring, inter-service dependencies, and cost-performance trade-offs, offering best practices for software engineers and architects designing high-performance cloud-native microservices systems.

Keywords: *Cloud-Native Architecture, Microservices, Performance Optimization, Containerization, Kubernetes, Service Mesh, Load Balancing, Distributed Systems, Scalability*



CONTAINER SECURITY CHALLENGES AND BEST PRACTICES IN KUBERNETES ENVIRONMENTS

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The widespread adoption of containerization and orchestration platforms has transformed the way modern applications are developed and deployed, with Kubernetes emerging as the de facto standard for managing containerized workloads. Despite its advantages in scalability and automation, Kubernetes introduces several security challenges due to its complex architecture, dynamic environments, and shared responsibility model. This study analyzes container security challenges and best practices in Kubernetes environments, focusing on threats such as insecure container images, misconfigured access controls, vulnerable workloads, supply chain risks, and runtime attacks. Using an industry-oriented approach, the research reviews real-world security incidents, industry reports, and practitioner insights to evaluate existing security mechanisms and mitigation strategies. The findings highlight the importance of adopting best practices including image scanning, role-based access control (RBAC), network policies, secrets management, runtime security monitoring, and DevSecOps integration. The study concludes that a proactive, layered security approach is essential for ensuring robust protection of containerized applications in Kubernetes-based deployments, while maintaining operational efficiency and scalability.

Keywords: *Container Security, Kubernetes Environments, Cloud-Native Security, RBAC, DevSecOps, Container Orchestration, Vulnerability Management, Runtime Security, Software Deployment.*

DEVELOPER PRODUCTIVITY MEASUREMENT USING ENGINEERING ANALYTICS

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Measuring developer productivity has become increasingly complex in modern software engineering environments due to the adoption of agile methods, distributed teams, and cloud-native development practices. Traditional productivity metrics based solely on lines of code or hours worked fail to capture the true value delivered by software developers. This study focuses on developer productivity measurement using engineering analytics, leveraging data generated across the software development lifecycle, including version control systems, issue trackers, CI/CD pipelines, and code quality tools. The research analyzes key engineering metrics such as lead time, cycle time, deployment frequency, code churn, defect density, and review turnaround time to provide a holistic view of developer productivity. Using an industry-oriented empirical approach, the study evaluates how data-driven insights can support better decision-making, improve workflow efficiency, and enhance team performance without encouraging counterproductive behaviors. The findings demonstrate that engineering analytics enables organizations to measure productivity more accurately, identify bottlenecks, and foster continuous improvement while aligning developer outcomes with business goals.

Keywords: *Developer Productivity, Engineering Analytics, Software Metrics, Agile Development, DevOps, CI/CD Pipelines, Code Quality, Software Engineering Performance, Data-Driven Decision Making.*



AI-POWERED SUSTAINABLE DEVELOPMENT IN INDIA

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Artificial Intelligence (AI) has become an influential technological paradigm capable of reshaping how developing economies address sustainability-related challenges. Through capabilities such as large-scale data processing, predictive analytics, and automated decision-support systems, AI can enhance responses to persistent problems including inefficient resource utilization, environmental stress, and socio-economic disparities. In recent years, AI-driven technologies have gained increasing attention as critical enablers of sustainable development, particularly in countries striving to balance rapid economic growth with environmental protection and social inclusion. India, as one of the world's fastest-growing economies, faces unique and interconnected sustainability challenges arising from rapid population growth, accelerated urbanization, climate change impacts, and increasing pressure on natural resources. Traditional development approaches and policy frameworks often struggle to manage these challenges due to their complexity, scale, and dynamic nature. In this context, AI-based systems provide an opportunity to enhance evidence-based policymaking, improve service delivery, and optimize resource utilization across multiple sectors. The integration of AI into development planning has the potential to transform how sustainability goals are designed, monitored, and achieved in the Indian context.

Keywords: *Artificial Intelligence; Sustainable Development; Sustainable Development Goals (SDGs); Smart Agriculture; Renewable Energy Systems; Smart Cities; Digital Governance; Climate Resilience; Emerging Economies; India*

DEEP LEARNING APPROACHES IN IMAGE PROCESSING: TECHNIQUES, APPLICATIONS, AND CHALLENGES

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Deep learning has revolutionized the field of image processing by enabling automatic feature extraction and significantly improving **accuracy** in visual analysis tasks. Traditional image processing techniques relied heavily on handcrafted features and rule-based methods, which often struggled with complex and large-scale data. In contrast, deep learning models—particularly convolution neural networks (CNNs)—have demonstrated remarkable performance in tasks such as image classification, object detection, segmentation, and pattern recognition. This paper explores the integration of deep learning techniques in image processing, highlighting key architectures, learning strategies, and advancements that have enhanced image understanding and interpretation. The study also discusses applications across various domains including medical imaging, surveillance, autonomous systems, and remote sensing. Despite its advantages, challenges such as high computational requirements, data dependency, and model interpretability remain critical concerns. The paper emphasizes ongoing research directions aimed at optimizing performance, reducing complexity, and improving generalization. Overall, deep learning-driven image processing represents a transformative approach with significant potential to advance intelligent systems and real-world applications.

Key words: *Tools and Frameworks (TensorFlow, PyTorch, Keras, OpenCV, CUDA and GPU Acceleration)*



ABSTRACT

**LIGHTWEIGHT ATTENTION-BASED SCENE TEXT DETECTION AND
RECOGNITION FOR REAL-TIME APPLICATIONS**

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Scene text detection and recognition are essential components of many real-world applications, including intelligent transportation systems, mobile document analysis, and augmented reality. Although deep learning-based methods have achieved remarkable accuracy, many existing models are computationally expensive and unsuitable for real-time or resource-constrained environments. In this paper, we propose a lightweight attention-based framework for efficient scene text detection and recognition. The proposed method employs a compact convolutional backbone for text localization and an attention-guided sequence recognition module for transcription. By integrating spatial attention and efficient feature encoding, the framework achieves a favorable trade-off between accuracy and computational complexity. Experimental results on benchmark datasets demonstrate that the proposed approach provides competitive performance while significantly reducing model size and inference time, making it suitable for real-time deployment.

Keywords: *Scene Text Detection, Text Recognition, Lightweight Models, Attention Mechanism, Deep Learning*

**AN INTELLIGENT MACHINE LEARNING FRAMEWORK FOR MULTI-CLASS ECG
ARRHYTHMIA DETECTION**

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Hearth disease is one of the leading causes of death in both developed and developing nations. It is estimated that 17.3 million people die from cardiovascular diseases annually, which comprise 30% of annual global deaths. Current estimates suggest that this number will increase to 23.3 million by 2030. In many instances, patients suffer fatal cardiac events (e.g., myocardial infarction) because they are unable to arrive at the hospital in time for treatment. Therefore, timely identification of symptoms leading to the development of cardiovascular diseases (e.g., heart attack) is critical to the reduction of mortality rates associated with heart disease. The electrocardiogram (ECG) is a valuable tool used in the monitoring of patients and in identifying patients with cardiovascular disease. The electrocardiogram records small fluctuations in the amount of electrical activity that occurs in the human heart during the normal processes of depolarization and repolarization of the heart. The ECG is utilized extensively by cardiologists for the analysis of the electrical rhythm of patients' hearts as well as for monitoring the status of patients who have developed morbidity as a result of heart disease. Cardiologists experience significant challenges when attempting to manually analyze large numbers of ECG periods of time in a sufficiently short period of time and simultaneously noting unusual variations in the morphology of the heart's electrical impulses throughout the exercise test. Therefore, there is a necessity for developing computer-based automated methods of diagnosing those individuals with signs of cardiovascular disease.



ABSTRACT

**OPTIMIZING CYBER-PHYSICAL PRODUCTION SYSTEMS (CPPS): SYNERGIZING
LEAN METHODOLOGY WITH IOT FOR REAL-TIME WASTE REDUCTION**

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The contemporary landscape of production engineering is currently undergoing a paradigm shift, transitioning from static mass-production models to highly flexible, data-driven frameworks categorized under Industry 4.0. This research paper investigates the critical synthesis of Lean Manufacturing principles with Cyber-Physical Systems (CPS) to address the inherent limitations of traditional shop-floor management. Despite the historical success of Lean methodologies—such as Kanban, Total Productive Maintenance (TPM), and Value Stream Mapping (VSM)—these tools often suffer from "data latency," where the time between a production anomaly occurring and its detection by management leads to significant waste. This study proposes an integrated "Smart-Learn" framework that leverages the Industrial Internet of Things (IIoT) to automate data acquisition and provide real-time visualization of production bottlenecks. By embedding sensors within CNC machinery and utilizing RFID tracking for Work-in-Process (WIP) inventory, the proposed system transforms the traditional VSM from a static, paper-based snapshot into a dynamic, living model. The methodology employed in this research follows a Design Science Research (DSR) approach, utilizing a simulated manufacturing environment to test the impact of real-time feedback loops on Overall Equipment Effectiveness (OEE). Key findings indicate that the integration of predictive analytics significantly reduces unplanned downtime by transitioning from reactive to pro-active maintenance schedules. Specifically, the application of machine learning algorithms to vibration and thermal data allows for the identification of tool wear patterns before catastrophic failure occurs. Furthermore, the research explores the "Human-in-the-Loop" (HitL) concept, emphasizing that the digitization of production engineering does not marginalize the human worker but rather empowers the workforce through Augmented Reality (AR) assistance and simplified decision-support systems.

Keywords: *Industry 4.0, Lean Manufacturing, Cyber-Physical Systems, Overall Equipment Effectiveness (OEE), Industrial Internet of Things (IIoT), Predictive Maintenance, Value Stream Mapping (VSM)*

REGULATING GENERATIVE AI: LEGAL AND POLICY FRAMEWORKS

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Generative Artificial Intelligence (AI) has emerged as a powerful technology capable of autonomously producing human-like text, images, audio, and software code. While its rapid adoption has accelerated innovation across multiple domains, it has also introduced complex legal, ethical, and policy-related challenges. Issues such as misinformation, deepfake generation, data privacy violations, intellectual property disputes, and lack of accountability have raised serious concerns regarding the unregulated use of generative AI systems. This paper examines the necessity of regulating generative AI by analyzing existing legal and policy frameworks implemented across major jurisdictions, including the European Union, the United States, and China. A comparative analysis is conducted to identify key regulatory principles such as transparency, risk-based governance, human oversight, and accountability. The study further highlights challenges in implementing effective AI regulation, including rapid technological evolution and lack of global harmonization. Finally, the paper proposes policy recommendations aimed at ensuring responsible development and deployment of generative AI while balancing innovation, public safety, and ethical responsibility.

Keywords- *Generative Artificial Intelligence, AI Regulation, Legal Frameworks, AI Governance, Ethics of AI, Risk-Based Regulation*



ABSTRACT

QUALITATIVE ANALYSIS OF FRUIT PEEL AND ITS ELEMENTAL DETECTION BY AAS

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The present study investigates the qualitative phyto chemical composition and quantitative elemental analysis of *Musa X paradisiaca* (raw banana) and *Carica papaya* Linn (raw papaya) peels to evaluate their nutritional and bioactive potential. Although commonly discarded as agricultural waste, these fruit peels may serve as valuable sources of bioactive compounds and essential micronutrients. Samples were collected from Bilaspur, Chhattisgarh, shade-dried, powdered, and subjected to standard extraction procedures for analysis. Qualitative phyto chemical screening was performed using established protocols, including Wagner's test for alkaloids, Benedict's test for carbohydrates, Ninhydrin test for amino acids, Keller—Killiani test for glycosides, and the foam test for saponins. The results confirmed the presence of alkaloids, saponins, carbohydrates, tannins, glycosides, and phytosterols in both peel samples. Amino acids were absent, while proteins showed variable responses. Cardiac glycosides were not detected in either species. Quantitative elemental analysis was carried out using Atomic Absorption Spectroscopy (AAS) to determine the concentrations of Iron (Fe), Manganese (Mn), Zinc (Zn), and Copper (Cu). A linear relationship between sample concentration and elemental content was observed. Comparative results revealed higher micronutrient levels in papaya peels than in banana peels, with iron content measuring 29.896 ppm and 21.874 ppm, respectively. The overall concentration trend was Fe>Mn >Zn>Cu. The findings highlight the potential of these fruit peels as sustainable sources for nutraceutical, functional food, and pharmaceutical applications.

Keywords: *Musax Paradisiaca, Carica Papaya, AAS, Iron, Copper, Ninhydrin Test, Keller- Killiani Test.*

ROLE OF PROXIMATE & ULTIMATE ANALYSIS FROM MINE SITE EXTRACTION TO SCIENTIFIC EVALUATION

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This work was undertaken to explore and understand the complete process of coal sampling and quality assessment. Given its critical role in the national energy mix, this work was undertaken to explore and understand the complete process of coal sampling and quality assessment. Sample was specially collected from Chirimiri coal mines. The coal sample underwent primary and secondary crushing, pulverization, systematic labelling, and sample preservation prior to testing. As per Indian Standard Protocols laboratory analysis include parameters such as moisture, ash content, volatile matter, fixed carbon in proximate analysis and sulphur content, and gross calorific value in ultimate analysis were measured. The sample revealed an ash content of (63.16%), moisture (4.07%), volatile matter (14.39%), low fixed carbon (18.38%) and a Gross Calorific Value (GCV) of 1897.93 kcal/kg, indicating lower thermal efficiency. The sulfur content was very low (0.09%), indicating minimal environmental impact. This project provides a detailed workflow from mine-site extraction to scientific evaluation, ensuring its optimal industrial application and energy performance.

Keywords: *Coal, ash, moisture, Gross Calorific Value, Proximate Analysis, Ultimate Analysis.*



ABSTRACT

ADAPTIVE COGNITIVE DIGITAL TWINS (ACDT) FOR RESILIENT PRODUCTION SYSTEMS IN INDUSTRY 5.0

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The transition from the efficiency-driven paradigm of Industry 4.0 to the human-centric and resilient goals of Industry 5.0 necessitates a fundamental evolution in how production systems are modeled and managed. While traditional Digital Twins (DT) have successfully enabled real-time monitoring and predictive maintenance, they remain largely "information-rich but wisdom-poor," acting as reactive mirrors rather than proactive decision-makers. Such systems often fail to navigate the high-entropy environments characterized by "Black Swan" disruptions, supply chain volatility, and the unpredictable nature of human-machine collaboration. This research addresses these limitations by proposing a novel framework for Adaptive Cognitive Digital Twins (ACDT)—virtual entities capable of reasoning, learning, and autonomous reconfiguration. The core of this research is the development of a multi-layered cognitive architecture that integrates Reinforcement Learning (RL) and Graph Neural Networks (GNN). Unlike standard models, the ACDT utilizes a Knowledge Graph to encode the "contextual experience" of the production floor, allowing it to move beyond simple data-matching to complex pattern recognition. The methodology follows a rigorous three-stage validation process. First, a high-fidelity virtual replica of a modular assembly line was constructed using a Markov Decision Process (MDP) to model state transitions during catastrophic failures. Second, an "Adaptivity Layer" was introduced, utilizing Proximal Policy Optimization (PPO) to enable the system to autonomously reschedule tasks and re-allocate robotic assets when a physical node fails. Third, the framework incorporates a human-centric feedback loop, using computer vision to monitor operator fatigue and cognitive load, thereby allowing the ACDT to adjust the "Takt Time" of collaborative robots to ensure safety and ergonomic stability.

Keywords: *Industry 5.0, Cognitive Digital Twins, Production Resilience, Reinforcement Learning, Self-Healing Systems, Cyber-Physical Systems, Sustainable Manufacturing.*

OPTIMIZING ENERGY CONVERSION: THE ROLE OF INTELLIGENT MECHATRONICS IN SUSTAINABLE POWER GENERATION

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The rapid escalation of global energy demand and mounting environmental concerns has significantly accelerated the transition from conventional fossil fuels to renewable energy sources. To address challenges regarding efficiency, reliability, and automation in these systems, mechatronics has emerged as a crucial enabling technology. By synergistically integrating mechanical engineering, electronics, control systems, and information technology, mechatronic systems optimize the performance of renewable energy infrastructures. This paper explores the diverse applications of mechatronics across wind energy, solar energy, and hydropower systems. The study provides a detailed analysis of how sensors, actuators, control algorithms, and intelligent monitoring enhance energy conversion efficiency, operational stability, and overall system sustainability. Furthermore, the paper discusses practical data and case studies—such as the 46.46% increase in energy harvest from dual-axis solar trackers and the 20% efficiency gains in variable speed wind turbines—to demonstrate the real-world impact of these technologies. Future development trends, including the integration of Artificial Intelligence, Internet of Things (IoT), and digital twin technology, are also examined alongside the associated challenges of high initial investment and harsh environmental conditions. This comprehensive review provides valuable insights for researchers and engineers working toward a more autonomous and efficient renewable energy future.

Keywords: *Mechatronics, Hydropower, Renewable energy, Wind energy, Solar energy, Intelligent control, Energy efficiency.*



ABSTRACT

**EXPERIMENTAL INVESTIGATION OF PERFORMANCE ENHANCEMENT IN
HEAT PIPE–BASED EVACUATED TUBE SOLAR COLLECTORS**

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Evacuated Tube Collectors (ETCs) are among the most efficient solar thermal technologies due to their ability to minimize heat losses and maintain high operating temperatures under diverse climatic conditions. However, the overall efficiency of an ETC system is highly dependent on its design configuration. This research paper investigates the best design strategies for maximizing the thermal efficiency of evacuated tube collectors. Key design parameters such as absorber coating, tube geometry, heat transfer mechanisms, manifold configuration, tilt angle, and the use of optical enhancement devices are critically analyzed. The study synthesizes findings from experimental and analytical research to identify optimal design combinations that significantly improve collector performance. The results indicate that advanced selective coatings, heat pipe–based designs, optimized tube dimensions, and enhanced manifold systems play a crucial role in achieving high-efficiency ETC systems suitable for domestic and industrial applications.

Keywords: *Evacuated Tube Collector, Solar Thermal Energy, Collector Design, Thermal Efficiency, Renewable Energy*

**SMART MANUFACTURING AND 3D PRINTING: HOW THEY FIT TOGETHER IN
INDUSTRY 4.0**

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Industry 4.0 represents a paradigm shift in manufacturing, driven by digitalization, automation, and intelligent decision-making. Smart manufacturing integrates advanced technologies such as the Internet of Things (IoT), artificial intelligence, cyber-physical systems, and big data analytics to create adaptive and autonomous production environments. In parallel, 3D printing, also known as additive manufacturing, has evolved as a disruptive fabrication technology offering design flexibility and decentralized production. This paper examines how smart manufacturing and 3D printing converge within the Industry 4.0 framework. The study analyzes enabling technologies, integration architectures, industrial applications, and key benefits, while also addressing current challenges and future research opportunities. The findings highlight that the synergy between smart manufacturing and 3D printing is essential for achieving agile, resilient, and data-driven industrial systems.

Keywords: *Industry 4.0, Smart Manufacturing, Additive Manufacturing, 3D Printing, Digital Transformation*



ABSTRACT

A STUDY ON AR/VR BASED GAMING IN MODERN ERA

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This paper presents a study on AR-VR gaming in the modern era. The study explains the concepts of augmented reality and virtual reality and their applications in gaming and modern technology. It also discusses the evolution of gaming from early gaming systems and arcade games to modern AR-VR-based gaming. The paper highlights the role of AR and VR in education, entertainment, and career opportunities, and examines their advantages such as immersive experience, realistic interaction, and user engagement, as well as their disadvantages including health issues, high cost, and technical limitations. The study concludes that in the future, AR and VR are expected to become more advanced, affordable, and widely used. Overall, AR and VR technologies are transforming digital interaction and have strong potential for future development.

**DEEP LEARNING FOR AUTOMATED AMERICAN SIGN LANGUAGE
RECOGNITION: A CNN-BASED APPROACH**

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American Sign Language (ASL) serves as the primary mode of communication for millions of deaf and hard-of-hearing individuals in North America. However, the linguistic barrier between signers and the hearing majority often leads to social exclusion and limited access to essential services. This paper presents the design, implementation, and evaluation of a robust Deep Learning classifier capable of recognizing static ASL hand gestures to bridge this communication gap. Utilizing a Convolutional Neural Network (CNN) based on the ResNet18 architecture, the proposed model achieves 100% accuracy on the validation set of the ASL Alphabet dataset. The system demonstrates high precision and recall across all 29 classes, suggesting its potential as a core component for realtime assistive communication tools. The project automates the challenge through advanced computer vision, data augmentation, and transfer learning techniques, offering a scalable solution for automated sign language interpretation.

Keywords: *American Sign Language, Deep Learning, CNN, ResNet18, Computer Vision, Assistive Technology, Transfer Learning*



ABSTRACT

**TEMPORAL AND STRUCTURAL ANALYSIS OF INFORMATION CASCADING
BEHAVIOR IN ONLINE SOCIAL MEDIA NETWORKS**

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The rapid growth of online social networks has intensified the complexity of information diffusion, giving rise to dynamic and large-scale cascading behaviors under uncertain and evolving environments. This research focuses on the temporal and structural analysis of information cascading behavior in online social networks, aiming to understand how information propagates, transforms, and influences collective user behavior over time. The study investigates group behavior patterns by examining temporal interaction dynamics and network structures to capture uncertainty arising from incomplete information, noisy interactions, and fluctuating user engagement. The proposed research further explores social media segregation by identifying community structures and interaction boundaries that shape diverse information flows and user perspectives. By leveraging network metrics and machine learning techniques, the study seeks to predict socially isolated and socially integrated users, thereby revealing their roles in cascade initiation and propagation. In addition, the research analyzes knowledge transformation processes, examining how information evolves, mutates, and gains or loses semantic meaning as it cascades through different social groups. To enhance the reliability of cascade analysis, the study incorporates anomaly detection mechanisms to identify abnormal diffusion patterns caused by misinformation, automated accounts, or coordinated behavior. The outcome of this research is expected to contribute a comprehensive and scalable analytical framework that integrates temporal dynamics, structural properties, and behavioral insights to evaluate cascading behavior in social media networks. The findings will support improved understanding of information diffusion, anomaly identification, and decision-making in social computing and network science applications.

Keywords: *Information Cascading, Online Social Networks, Temporal and Structural Analysis, Social Media Segregation, Knowledge Transformation, Anomaly Detection.*

**THD REDUCTION IN A FIVE-LEVEL MULTILEVEL INVERTER USING
OPTIMIZED PWM TECHNIQUE FOR RENEWABLE ENERGY APPLICATIONS**

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The large-scale integration of renewable energy sources has intensified power quality challenges in modern power systems, particularly in terms of harmonic distortion. Multilevel inverters (MLIs) are widely adopted in renewable energy applications due to their superior harmonic performance and reduced switching stress. This paper presents a comprehensive simulation-based investigation of Total Harmonic Distortion (THD) reduction in a five-level multilevel inverter using an optimized Selective Harmonic Elimination Pulse Width Modulation (SHE-PWM) technique. Metaheuristic optimization algorithms, namely Differential Evolution (DE), Particle Swarm Optimization (PSO), and Grey Wolf Optimizer (GWO), are comparatively analyzed under identical operating conditions using a Python-based simulation framework. FFT-based harmonic analysis and THD evaluation are performed in accordance with IEEE 519 standards. The simulation results demonstrate that the DE-based SHE-PWM technique achieves superior harmonic suppression and enhanced robustness compared to PSO and GWO, resulting in significantly reduced THD. These findings highlight the suitability of the proposed approach for renewable energy interfacing and grid-connected power electronic applications.

Keywords: *Five-level multilevel inverter; Selective harmonic elimination; Differential Evolution; Particle Swarm*



ABSTRACT

**A MACHINE LEARNING-DRIVEN FRAMEWORK FOR MULTI-CLASS ECG
ARRHYTHMIA CLASSIFICATION**

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Hearth disease is one of the leading causes of death in both developed and developing nations. It is estimated that 17.3 million people die from cardiovascular diseases annually, which comprise 30% of annual global deaths. Current estimates suggest that this number will increase to 23.3 million by 2030. In many instances, patients suffer fatal cardiac events (e.g., myocardial infarction) because they are unable to arrive at the hospital in time for treatment. Therefore, timely identification of symptoms leading to the development of cardiovascular diseases (e.g., heart attack) is critical to the reduction of mortality rates associated with heart disease. The electrocardiogram (ECG) is a valuable tool used in the monitoring of patients and in identifying patients with cardiovascular disease. The electrocardiogram records small fluctuations in the amount of electrical activity that occurs in the human heart during the normal processes of depolarization and repolarization of the heart. The ECG is utilized extensively by cardiologists for the analysis of the electrical rhythm of patients' hearts as well as for monitoring the status of patients who have developed morbidity as a result of heart disease. Cardiologists experience significant challenges when attempting to manually analyze large numbers of ECG periods of time in a sufficiently short period of time and simultaneously noting unusual variations in the morphology of the heart's electrical impulses throughout the exercise test. Therefore, there is a necessity for developing computer-based automated methods of diagnosing those individuals with signs of cardiovascular disease.

AI-ORIENTED ROBOTIC NURSE FOR MEDICAL SUPPORT

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Artificial Intelligence (AI) and robotics are rapidly transforming modern healthcare systems by enabling intelligent automation, predictive diagnostics, and continuous patient monitoring. One of the most promising developments in this field is the AI-oriented robotic nurse — an intelligent healthcare support system designed to assist medical professionals in clinical tasks such as patient monitoring, disease detection, medication management, emergency response, and routine treatment support. This research paper presents a comprehensive study of AI robotic nurses, including their architecture, core technologies, functional capabilities, clinical applications, ethical considerations, implementation challenges, and future scope. The study also explores research trends, methodology design considerations, real-world applicability, and global healthcare impact. The results suggest that AI robotic nurses have strong potential to improve healthcare efficiency, reduce medical workload, enhance patient safety, and increase healthcare accessibility, especially in resource-limited regions. However, ethical governance, data privacy protection, and cost reduction remain critical challenges for large-scale adoption.

Keywords: *Artificial Intelligence, Healthcare Robotics, Robotic Nurse, Medical AI, Smart Healthcare, IoMT, Clinical Decision Support, Medical Automation*



ABSTRACT

VELO: AN IOT-BASED SMART CYCLE SHARING SYSTEM FOR SUSTAINABLE URBAN MOBILITY

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Rapid urbanization and increasing vehicular traffic have resulted in severe congestion, environmental pollution, and excessive fuel consumption in urban regions. Sustainable transportation solutions are necessary to address these challenges effectively. This paper presents Velo, an Internet of Things (IoT)- based Smart Cycle Sharing System designed to promote ecofriendly and efficient short-distance travel. The proposed system integrates an Arduino Uno microcontroller, Bluetooth communication module, and QR code-based authentication mechanism to enable secure and automated cycle locking and unlocking. The architecture consists of three major layers: device layer, application layer, and cloud backend layer. The mobile application allows users to register, check cycle availability, scan QR codes, unlock cycles via Bluetooth, and track ride history. Backend services manage authentication, ride data storage, and reward point calculations. Agile development methodology was adopted to ensure iterative improvements and system reliability. Experimental implementation demonstrated efficient communication with Bluetooth response time under two seconds. The system proved cost-effective, scalable, and technically feasible. Velo supports sustainable urban mobility by reducing carbon emissions and promoting smart city initiatives.

Keywords: *IoT, Smart Mobility, Cycle Sharing System, Arduino Uno, Bluetooth Communication, QR Code Authentication, Sustainable Transportation, Smart City Infrastructure*

ENGINEERING IMMERSIVE ADVERTISING SYSTEMS IN THE INDIAN METAVERSE: SYSTEM ARCHITECTURE, AI-DRIVEN PERSONALIZATION, AND ETHICAL GOVERNANCE FRAMEWORK

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The rapid evolution of immersive virtual environments has accelerated the integration of advertising mechanisms within metaverse platforms, transforming traditional digital marketing into interactive, experience-centric ecosystems. In the Indian digital landscape characterized by large-scale mobile penetration, expanding 5G infrastructure, and increasing adoption of virtual and augmented reality technologies the engineering of secure and scalable immersive advertising systems presents both significant opportunities and complex challenges. However, existing studies primarily focus on marketing perspectives, with limited emphasis on system-level architecture, AI-driven personalization mechanisms, and governance models tailored to emerging economies. This paper proposes a comprehensive engineering framework for immersive advertising systems in the Indian metaverse ecosystem. The study introduces a multi-layered system architecture comprising user interaction interfaces, real-time rendering engines, AI-based decision layers, distributed cloud-edge computing infrastructure, and a secure data management module. The proposed architecture integrates machine learning-based behavioral profiling, collaborative filtering, and reinforcement learning techniques to enable dynamic, context-aware advertisement delivery within 3D virtual environments. Furthermore, the framework incorporates privacy-preserving mechanisms, algorithmic transparency protocols, and consent-driven data governance aligned with India's digital regulatory environment. In addition to architectural modeling, the study examines latency optimization, scalability constraints, cybersecurity vulnerabilities, and ethical risks associated with immersive behavioral targeting. A structured ethical governance layer is proposed to mitigate manipulative personalization, ensure responsible AI deployment, and enhance trust in metaverse advertising ecosystems. The findings contribute to the interdisciplinary convergence of computer engineering, artificial intelligence, and digital advertising by presenting a technically grounded and ethically responsible blueprint for next-generation immersive marketing systems in India.

Keywords : *Metaverse; Immersive Advertising Systems; AI-Driven Personalization; Machine Learning in Marketing*



ABSTRACT

**MICROCLIMATE-DRIVEN FUNGAL SUCCESSION IN DISCARDED VEGETABLES:
A COMPARISON OF SUN-EXPOSED AND SHADED CONDITIONS**

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This study investigates how microclimatic variation influences fungal succession in discarded vegetables, with particular attention to the contrasting dynamics of sun-exposed and shaded conditions. While organic waste decomposition has been widely examined, the role of fine-scale environmental heterogeneity in structuring fungal communities remains insufficiently resolved. To address this gap, we conducted a controlled field experiment in which comparable vegetable residues were placed under direct sunlight and continuous shade, and monitored over a defined decomposition period. Microclimatic variables, including temperature, relative humidity, and surface moisture, were recorded alongside systematic sampling of fungal communities using culture-based isolation and morphological and molecular identification. Temporal patterns of colonization, species turnover, and community composition were analysed to evaluate differences in successional trajectories between treatments. The results demonstrate that sun-exposed residues experienced accelerated moisture loss and higher temperature fluctuations, conditions that favoured early dominance by xerotolerant and opportunistic taxa but led to reduced overall diversity at later stages. In contrast, shaded environments maintained higher and more stable humidity, supporting a more gradual and diverse successional sequence characterized by prolonged coexistence of primary colonizers and secondary decomposers. We conclude that microclimatic context is a critical determinant of fungal succession in decomposing vegetable waste, with implications for nutrient cycling, waste management strategies, and the ecological forecasting of decomposition processes under changing environmental conditions.

Keywords: *fungal succession; microclimate; vegetable waste decomposition; sun-exposed conditions; shaded environments; community dynamics; species turnover; environmental heterogeneity; nutrient cycling; decomposition ecology.*

**A FOCUSED SURVEY ON MACHINE LEARNING AND HYBRID INTELLIGENT
METHODS IN WIRELESS SENSOR NETWORKS**

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Wireless Sensor Networks (WSNs) have become a foundational sensing infrastructure for smart cities, industrial monitoring, agriculture, and disaster management. However, WSN deployments are constrained by limited energy, dynamic topology, lossy wireless links, noisy sensing, and potential security threats. These constraints make classical rule-based protocols insufficient for long-term and adaptive operation. Machine Learning (ML) has emerged as a key enabler for data-driven decision making in WSNs, improving tasks such as anomaly detection, clustering, routing, and energy prediction. In addition, hybrid intelligent approaches that integrate ML with optimization, fuzzy logic, or reinforcement learning have gained attention for improving reliability and energy efficiency. This paper presents a focused survey of ML and hybrid intelligent methods for WSNs published between 2020 and 2026. The survey provides a structured taxonomy, comparative literature review, and critical analysis of methods and datasets. Finally, open research challenges and future directions are identified to support robust, energy-aware, and scalable ML-driven WSN systems.

Index Terms—*Wireless Sensor Networks, Machine Learning, Deep Learning, Reinforcement Learning, Clustering, Routing, Anomaly Detection, Energy Prediction, Hybrid Intelligent Systems*



ABSTRACT

**PERFORMANCE AND SECURITY ANALYSIS OF BLOCKCHAIN SYSTEMS
UNDER NETWORK, CONSENSUS, AND RESOURCE CONSTRAINTS**

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Blockchain technology has emerged as a foundational infrastructure for decentralized and trustless systems, enabling secure data sharing, transparent transaction execution, and tamper-resistant record keeping without centralized control. Despite its rapid adoption in crypto currencies, supply chain management, healthcare, and Internet-of-Things (IoT) ecosystems, blockchain systems face significant performance and security challenges when deployed in real-world environments. These challenges arise from heterogeneous network latency, continuous blockchain storage growth, temporary network partitions, adversarial transaction flooding, validator centralization in proof-of stake mechanisms, and the increasing participation of resource constrained edge devices. This paper presents a comprehensive simulation-driven experimental analysis of blockchain performance and security under realistic operating constraints. Using controlled discrete event simulations inspired by established frameworks such as SimBlock and BlockSim, we design and execute six targeted experiments. These experiments evaluate (i) block propagation delay in geographically distributed networks, (ii) long-term blockchain storage bloat and its impact on node synchronization, (iii) fork recovery behavior following network partitions, (iv) resilience against DDoS-like transaction flooding, (v) validator centralization risks in proof-of-stake systems, and (vi) blockchain latency in edge-computing environments. All experiments are implemented in Python using reproducible simulation models with configurable parameters. Quantitative metrics such as propagation delay percentiles, fork rates, synchronization time, transaction throughput, mempool growth, decentralization indices, and validation latency are collected and analyzed. The results provide empirical insight into how performance bottlenecks and security vulnerabilities manifest under practical conditions. This study contributes a unified experimental methodology and highlights critical trade-offs between scalability, decentralization, and security in modern blockchain systems.

Index Terms—Blockchain, Performance Analysis, Security Evaluation, Network Latency, Fork Recovery, Storage Scalability, DDoS Resilience, Proof-of-Stake, Edge Computing

STOCK MARKET PRICE PREDICTION USING ML

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Stock market price prediction has long been a central topic in financial research due to its economic importance and the inherent complexity of financial markets. Traditional financial theory, particularly the Efficient Market Hypothesis (EMH), suggests that stock prices fully reflect all available information, implying that predicting future prices is extremely difficult. However, with the advancement of computational techniques, machine learning models, and the availability of large financial datasets, researchers have increasingly explored data-driven approaches to improve predictive accuracy.



ABSTRACT

BAMBOO-REINFORCED CONCRETE STRUCTURAL ELEMENTS: A REVIEW

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As an alternative to conventional steel reinforcement, bamboo is increasingly gaining popularity, particularly in low-cost and resource-constrained construction. Owing to its high strength-to-weight ratio, rapid renewability, and widespread availability, bamboo-reinforced concrete (BRC) has emerged as a promising approach to reducing embodied energy and environmental impact. Despite its advantages, bamboo exhibits distinct material characteristics compared to steel, such as susceptibility to moisture and inadequate bond strength at the bamboo-concrete interface. To overcome these limitations, the effectiveness of chemical coatings and mechanical surface modifications in enhancing bond performance is critically evaluated. This review consolidates existing research on BRC structural elements, including beams, slabs, and walls. The mechanical behavior of bamboo covering its tensile, compressive, and flexural properties is summarized. Experimental studies indicate that treated bamboo can achieve load-carrying capacities comparable to steel-reinforced beams under specific conditions, offering a viable solution for sustainable construction. The review further identifies key knowledge gaps and outlines future research directions aimed at standardizing bamboo treatment methods and optimizing its application in structural engineering.

Keywords: *Bamboo, Sustainable construction, Bamboo-reinforced concrete, Bond strength*

**IMPACT OF HUMAN RESOURCE ACCOUNTING ON WORKFORCE PLANNING
AND MANAGEMENT IN FINTECH COMPANIES OF CHHATTISGARH**

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The long-term success of FinTech companies depends on how effectively they plan, manage, and utilize their human resources in a rapidly evolving technological environment. This study examines the impact of Human Resource Accounting (HRA) on workforce planning and management in FinTech companies operating in Chhattisgarh State. The primary objective is to assess how HRA practices support manpower planning, talent utilization, and managerial decision-making in technology-driven financial organizations. The study adopts a survey research design targeting employees from human resource and finance departments of selected FinTech firms in major cities of Chhattisgarh. Using purposive sampling, structured questionnaires were administered to collect primary data. The responses were analyzed using appropriate statistical methods to evaluate the relationship between HRA practices and workforce management outcomes. The findings indicate a significant positive relationship between Human Resource Accounting and effective workforce planning. Recognizing employees as valuable organizational assets improves manpower forecasting, enhances talent allocation, and supports evidence-based decision-making. The study also finds that HRA contributes to operational efficiency by aligning workforce capabilities with technological and organizational needs. The paper concludes that financial reporting in FinTech firms is incomplete without acknowledging human resources as strategic assets. Integrating HRA into management practices can strengthen workforce planning, improve operational efficiency, and enhance decision usefulness. The study recommends that accounting professionals and standard-setting bodies work towards developing standardized guidelines for Human Resource Accounting to encourage its adoption in emerging FinTech sectors.

Keywords: *Human Resource Accounting, Workforce Planning, FinTech, Operational Efficiency, Decision-Making, Chhattisgarh*



ABSTRACT

**EXPLAINABLE MULTIMODAL TRANSFORMER FRAMEWORK FOR EARLY
PREDICTION OF DIABETIC RETINOPATHY USING FUNDUS IMAGES AND
CLINICAL METADATA**

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Diabetic Retinopathy (DR) remains one of the leading causes of irreversible blindness worldwide, particularly among working-age diabetic populations. Existing automated detection systems predominantly rely on retinal fundus images and focus on late-stage classification rather than early risk prediction. Furthermore, most deep learning models operate as black-box systems, limiting clinical interpretability and trust. This paper proposes a novel explainable multimodal transformer framework for early DR risk prediction by integrating retinal fundus images with patient clinical metadata. The proposed system employs a Vision Transformer for extracting global retinal features, a dense embedding module for clinical variables, and a cross-attention fusion transformer for multimodal integration. Explainability is achieved using Grad-CAM and SHAP-based interpretation mechanisms. Experimental evaluation demonstrates that multimodal learning significantly improves predictive performance compared to unimodal image-based models, achieving higher accuracy, sensitivity, and early detection capability. The proposed framework provides a clinically realistic and interpretable solution for large-scale DR screening and early intervention.

Keywords: *Diabetic Retinopathy, Multimodal Learning, Vision Transformer, Explainable AI, Medical Image Analysis, Deep Learning.*

**AI AND MACHINE LEARNING IN ADVANCED 3D PRINTING FOR BIOMEDICAL
ENGINEERING: OPTIMIZING BIOPRINTING**

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3D printing is really cool especially when it comes to bioprinting. Bioprinting is a way to make tissues and organs.. There are still some problems to solve with bioprinting. For example the materials used in bioprinting are not always the same, which can cause problems. Also the things we print need to be strong and safe for people. This paper is about using intelligence and machine learning to make bioprinting better. We used machine learning to make the ink used in bioprinting called bioink, better. Machine learning also helped us predict what would happen when we printed something.. It even helped us find mistakes as we were printing. We used something called networks and reinforcement learning to do all this. The goal is to use bioprinting to help people, in the field of engineering. Bioprinting and biomedical engineering can really benefit from intelligence and machine learning. Our case study is about tissue scaffolds. We use intelligence models to figure out how well cells are doing and how strong the tissue is. These models are about 85 percent of the time. What we found out is that using these models can cut down on printing mistakes by 40 percent. It also helps make the tissue work better. This is a step towards making personalized regenerative medicine a reality. Vascularized tissue scaffolds and artificial intelligence are really important for getting past the problems with bioprinting. This matters for things, like organ transplantation and other medical treatments. Vascularized tissue scaffolds can really benefit from intelligence.

Keywords: *3D bioprinting, machine learning, biomedical engineering, tissue engineering, vascularization.*



ABSTRACT

**MACHINE LEARNING–DRIVEN MENTAL HEALTH ANALYTICS: CURRENT
TECHNIQUES AND EMERGING TRENDS**

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The fields of research, diagnosis, and intervention in mental health have been revolutionized by recent advances in artificial intelligence (AI) and machine learning (ML). The traditional process of clinical diagnosis has been enhanced by the scalable, objective, and data-driven tools of these technologies. Based on the reviewed literature (2022-2025), the diagnosis of mental illnesses like depression, anxiety, PTSD, schizophrenia, and bipolar disorder has been significantly improved by AI-assisted models, especially deep learning, natural language processing (NLP), and multimodal fusion models. Moreover, explainable AI (XAI) methods, wearable technology, and digital phenotyping are making way for dynamic, transparent, and personalized decision-support systems for healthcare professionals. To provide a current overview of the methods, assess their clinical applicability, and discuss the challenges and issues associated with them, this review combines the results of fifteen recent peer-reviewed articles. A future roadmap for the implementation of multimodal, explainable, and ethics-driven AI models in mental healthcare systems is provided in the conclusion of the paper.

Keywords: *Artificial Intelligence, Machine Learning, Mental Health, Deep Learning, Digital Phenotyping, Explainable AI, Cognitive Behavioral Therapy, Schizophrenia, Post-Traumatic Stress Disorder.*

AI-BASED FRAUD DETECTION SYSTEM FOR ONLINE TRANSACTIONS

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The rapid growth of digital payment platforms and e-commerce applications has significantly increased the risk of online financial fraud. Traditional rule-based fraud detection systems are limited in identifying complex and evolving fraud patterns, leading to high false positives and delayed responses. This project proposes an AI-Based Fraud Detection System that utilizes Machine Learning (ML) and Deep Learning (DL) techniques to detect fraudulent online transactions in real time with high accuracy. The system collects and analyzes transactional data such as transaction amount, timestamp, location, device information, user behavior patterns, and historical transaction records. Data preprocessing techniques including normalization, handling missing values, and feature engineering are applied to improve model performance. Various supervised learning algorithms such as Logistic Regression, Decision Trees, Random Forest, and Gradient Boosting are implemented and compared. Additionally, advanced models like Artificial Neural Networks (ANN) and Long Short-Term Memory (LSTM) networks are used to capture sequential transaction patterns and detect anomalies. To address the problem of class imbalance (since fraudulent transactions are rare compared to legitimate ones), techniques such as SMOTE (Synthetic Minority Over-sampling Technique) and cost-sensitive learning are employed. The system is evaluated using performance metrics including Accuracy, Precision, Recall, F1-Score, and ROC-AUC to ensure reliable fraud detection while minimizing false alarms. The proposed model is designed for real-time deployment using APIs, enabling financial institutions and e-commerce platforms to automatically flag suspicious transactions for further verification. By continuously learning from new data, the system adapts to emerging fraud patterns, enhancing overall cybersecurity and protecting users from financial losses.

Keywords: *Fraud Detection, Online Transactions, Cybersecurity, Anomaly Detection, SMOTE, Random Forest, Neural Networks, LSTM, Real-Time Monitoring, Financial Security, Data Mining, Predictive Analytics.*



ABSTRACT

**SIMULATION AND ANALYSIS FOR SOLAR POWERED EV CHARGING
STATION BASED ON MPPT**

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The fast growth of electric vehicles (EVs) demands sustainable and capable charging infrastructure. Solar photovoltaic (PV)-based EV charging stations offer a clean and decentralized solution. PV output is nonlinear and highly dependent on environmental conditions such as irradiance and temperature. Maximum Power Point Tracking (MPPT) algorithms are working to remove maximum available power from PV systems. This paper presents the simulation and performance analysis of a solar-powered EV charging station incorporated with an MPPT-controlled DC-DC converter. The system is model and simulated in MATLAB/Simulink. Performance parameters such as tracking maximum efficiency, charging period, voltage stability, and system efficiency are evaluate under varying environmental conditions. The outcome demonstrates that the MPPT-based system extensively improves energy insertion and charging efficiency compare to non-MPPT systems.

Keywords: *Solar PV, EV Charging Station, MPPT, DC-DC Converter, MATLAB/Simulink, Renewable Energy.*

ARTIFICIAL INTELLIGENCE OF THINGS (AIOT) FOR SMART CITIES

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Rapid urban expansion and the growing adoption of smart city infrastructures have intensified the need for intelligent road safety mechanisms capable of addressing complex traffic conditions. Traditional safety approaches are increasingly insufficient in managing real-time risks within highly connected urban transportation systems. To address this challenge, this study presents an integrated vehicle safety framework designed for smart city environments using the Artificial Intelligence of Things (AIoT) paradigm. The proposed framework combines multiple sensing technologies, including eye-blink detection, ultrasonic sensing, and alcohol monitoring, to enhance driver awareness and overall road safety. The eye-blink sensor continuously monitors driver alertness and triggers immediate auditory warnings when signs of fatigue are detected. Ultrasonic sensors support real-time assessment of nearby vehicles, enabling improved traffic regulation and collision avoidance. To mitigate risks associated with impaired driving, an alcohol sensing module evaluates the driver's alcohol concentration and, when unsafe levels are identified, automatically regulates vehicle speed while transmitting location-based. Furthermore, the framework incorporates Light Fidelity (Li-Fi) technology to strengthen inter-vehicle communication by enabling high-speed data exchange through visible light communication. This multi-layered AIoT-driven approach enhances situational awareness, communication efficiency, and preventive safety measures within smart city transportation networks. The proposed framework contributes to the development of intelligent, reliable, and sustainable urban mobility systems and provides a scalable foundation for future advancements in smart road safety solutions.

Keywords: *A IoT-Based Vehicle Safety, Smart City Transportation, Driver Fatigue Detection, Intelligent Road Safety Systems, Inter-Vehicle Communication*



ABSTRACT

**ATTENTION-BASED CONVOLUTIONAL NEURAL NETWORKS FOR GLAUCOMA
PREDICTION FROM FUNDUS IMAGES**

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Convolutional neural networks (CNNs) Attention-based have emerged as a capable approach for prediction of Glaucoma from the set of fundus images. This method is the combination of feature extraction through CNNs together with the Attention based mechanism to mainly focus in the important areas of the fundus images. The main components that is used is the convolutional layers that will be used for feature extraction and also, we are using attention-based approach for assigning weights in different regions of the images, for dimension reduction global average pooling will be used, and also for final classification fully connected layers is proposed. This method will provide various usefulness in terms of accuracy, greater interpretation with the help of attention mapping and good amount of learning which required lesser amount of training data. Additionally, robustness to change in image quality in terms of its pixel variations and procurementsituations. The attention mechanism model proposed to better understanding of relevant features, improving the ability of early detection of glaucoma. In Future research guidelines it may explore multi-modal attention approaches, also combining fundus image investigation with other clinical data sources to enhance investigative accuracy.

Keywords: *Glaucoma detection, Attention-based CNN, Retinal fundus images, Deep learning, Ophthalmic imaging*

**A COHESIVE APPROACH TO RELIABLE AI: RISK ASSESSMENT, GENERATIVE
INTELLIGENCE, AND GOVERNANCE STRATEGIES**

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The developing variety of Artificial intelligence(AI) system utilize in various sectors such a finance, health care, transportation, cyber security and critical infrastructure has expanded the choice to implement threat-conscious, trustworthy, reliable and powerful models of decision making. Although the predictable gadget mastering models cognizance on predictive reliability, they have a tendency to be unable to cope with uncertainty, rare ,adversarial and ethical duty consequently, current research in AI have been transferring closer to those architectures which explicitly aid threat modelling, robustness interpretability and governance practices. The current evaluate gives an syntactic over view of the current developments in threat conscious and trustworthy AI systems. The paper discusses the concepts of anomaly detection by using deep mastering uncertainty sensitive predictive models, generative AI driven pressure simulation, optimization focused mastering pipelines and explainable AI models. Several application in finance, healthcare cyber physical system and smart networks are critically tested which will point out the frequent barriers and design concepts. The difficulty in the evaluation of ethical issues, privacy protection and compliance with policies because of the inseparable factor of reliable AI systems. Finally the studies instruction are recommend to help in developing transparent and human friendly AI architectures that can be carried out in practical world.

Keywords: *Responsible AI, Reliable AI, Outlier Detection, Creative AI, Understandable AI, Safe Machine Learning Ethical AI Management*



ABSTRACT

GRID STABILITY PREDICTION USING MACHINE LEARNING: A COMPARATIVE STUDY OF ENSEMBLE AND HYBRID MODELS

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This paper presents a comprehensive analysis and predictive modeling approach for assessing grid stability using a dataset of simulated smart grid parameters. The primary objective was to develop and evaluate various machine learning models to accurately classify grid states as either stable or unstable. The methodology involved data loading, thorough initial data exploration, preprocessing including label encoding of the target variable and scaling of numerical features, and subsequent training and evaluation of multiple classification algorithms. Specifically, RandomForestClassifier, Logistic Regression, Gradient Boosting Classifier, XGBoost Classifier, and a Stacking Classifier (hybrid model) were implemented. Performance was evaluated using accuracy, precision, recall, F1-score, and confusion matrices. The analysis identified the XGBoost Classifier as the top-performing individual model. The hybrid Stacking Classifier further improved performance, exhibiting a slightly higher accuracy. The findings highlight the significant potential of advanced ensemble and hybrid machine learning techniques in enhancing grid stability prediction, offering crucial insights for proactive grid management and reliability.

Keywords- *Random Forest Classifier, Logistic Regression, Gradient Boosting Classifier, XGBoost Classifier, Stacking Classifier.*

REAL-TIME POWER QUALITY DISTURBANCE CLASSIFICATION USING HYBRID DEEP LEARNING: A CASE STUDY OF THE CSPDCL SMART GRID INFRASTRUCTURE

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The modernization of electrical distribution networks into smart grids necessitates high-fidelity monitoring of Power Quality (PQ). In the industrial corridors of Chhattisgarh, the Chhattisgarh State Power Distribution Company Limited (CSPDCL) faces significant challenges due to non-linear industrial loads, which introduce complex Power Quality Disturbances (PQDs). Traditional signal processing techniques often fail to achieve the latency and accuracy requirements for real-time applications. This paper proposes a novel hybrid deep learning architecture, combining 1D-Convolutional Neural Networks (1D-CNN) and Bidirectional Long Short-Term Memory (Bi-LSTM) networks, for the automated classification of PQDs. The 1D-CNN layers extract robust spatial features from raw voltage waveforms, while the Bi-LSTM layers capture long-term temporal dependencies and bidirectional signal trends. The model was validated using a comprehensive dataset derived from 33kV/11kV substations within the CSPDCL network, encompassing six disturbance classes: Voltage Sag, Swell, Interruption, Harmonics, Flicker, and Transients. Experimental results demonstrate a classification accuracy of 98.67% with an inference time of 12.4 ms per cycle, significantly outperforming conventional Machine Learning (ML) and standard Deep Learning (DL) models. The proposed framework provides a scalable solution for real-time grid health monitoring and proactive fault mitigation in heavy-industrial distribution sectors.

Keywords—*CSPDCL, Power Quality Disturbances, 1D-CNN, Bi-LSTM, Deep Learning, Smart Grid, Signal Processing.*



ABSTRACT

**REACTIVE POWER COMPENSATION BY FACTS DEVICE OF WIND ENERGY
CONVERSION SYSTEM**

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Wind Energy exchange Systems (WECS), particularly those based on induction generators like Doubly-Fed Induction Generators (DFIG) or Squirrel Cage Induction Generators (SCIG), describe reactive power from the grid due to their electrical characteristics. This reactive power demand affects voltage stability, better power quality, and grid combination. Flexible AC Transmission System (FACTS) devices such as STATCOM, SVC and UPFC give dynamic reactive power compensation, attractive voltage regulation, power quality and stability of grid-connected wind farm. This paper review the responsibility of FACTS in reactive power compensation, control strategy, and performance enhancement in WECS integration.

Keyword: *Wind Energy Conversion System (WECS); FACTS; STATCOM,SVC, voltage control, reactive power compensation.*

**GENDER NEUTRALITY IN WORKPLACE HARASSMENT LAWS: BALANCING
EQUALITY AND PROTECTION**

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Workplace harassment remains a pervasive challenge that undermines dignity, equality, and safe working conditions. In India, the primary legislative framework addressing sexual harassment at the workplace is the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, enacted to give effect to the constitutional guarantees of equality under Articles 14, 15, and 21 of the Constitution of India and the judicial mandate laid down in Vishaka v. State of Rajasthan. While the statute marked a significant step toward protecting women from workplace harassment, it adopts a gender-specific approach by recognizing only women as aggrieved persons. This paper critically examines the debate surrounding gender neutrality in workplace harassment laws and evaluates whether extending protection to all genders would strengthen or dilute existing safeguards. The study explores constitutional principles of equality and non-discrimination, analyzing whether a gender-neutral framework better aligns with contemporary understandings of inclusivity and evolving workplace dynamics. It also considers comparative perspectives from jurisdictions that recognize harassment victims irrespective of gender, thereby promoting substantive equality. At the same time, the paper addresses concerns that gender neutrality may inadvertently weaken the protective intent of current legislation, which was enacted in response to structural inequalities and disproportionate vulnerabilities faced by women. The research therefore assesses whether a balanced model—retaining sensitivity to gender-based power imbalances while expanding protection to male and LGBTQ+ employees—can achieve both equality and effective redressal. Adopting a doctrinal and comparative methodology, the study evaluates statutory provisions, judicial interpretation, and policy implications. It argues that the evolution toward gender neutrality must not obscure the lived realities of gendered discrimination but should aim to create an inclusive, victim-centric, and constitutionally consistent legal regime. Ultimately, the paper concludes that reconciling equality with protection requires nuanced reform, ensuring that workplace harassment laws reflect both the principles of formal equality and the demands of substantive justice.

Keywords: *Gender Neutrality; Workplace Harassment; Constitutional Equality; Substantive Justice; Legal Reform.*



ABSTRACT

**TRANSITION FROM INDIAN PENAL CODE TO BHARATIYA NYAYA SANHITA: A
CRITICAL ANALYSIS**

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The replacement of the Indian Penal Code with the Bharatiya Nyaya Sanhita marks a historic shift in India's criminal justice framework. Enacted during the colonial period, the IPC of 1860 served as the substantive criminal law for over 160 years. While it underwent numerous amendments, it retained colonial terminology, structure, and philosophy. The Bharatiya Nyaya Sanhita, 2023 (BNS), introduced as part of a broader reform of criminal laws, seeks to modernize offences, align legal provisions with constitutional values, and address emerging forms of crime such as organized crime, terrorism, cyber offences, and mob lynching. This paper critically analyses whether the transition represents a substantive transformation or merely a structural reclassification of offences. It examines key changes including the reorganization of chapters, increased focus on crimes against women and children, incorporation of community service as a punishment, enhanced victim-centric provisions, and stricter measures against offences threatening national integrity. The study also evaluates the expansion of definitions relating to organized crime and terrorist acts, and the shift toward time-bound investigation and trial processes in conjunction with procedural reforms. However, concerns remain regarding potential over-criminalization, increased executive discretion, and ambiguities in certain newly introduced provisions. Critics argue that while the nomenclature and arrangement have changed, several foundational principles—such as culpable homicide, murder, and general exceptions—continue largely from the IPC framework. The paper therefore assesses the extent to which the BNS reflects decolonization in substance rather than symbolism. By adopting a doctrinal and comparative approach, the research highlights the philosophical shift from colonial governance to citizen-centric justice, while questioning whether the reforms adequately address systemic challenges like delay, prison overcrowding, and investigative inefficiencies. Ultimately, the transition from IPC to BNS represents a significant legislative milestone, but its success will depend on judicial interpretation, effective implementation, and adherence to constitutional safeguards.

Key Words: *Bharatiya Nyaya Sanhita; Indian Penal Code; Criminal Law Reform; Decolonization of Law; Victim-Centric Justice.*

**IMPACT OF AI-POWERED AUTOMATION ON NEWS GATHERING AND CONTENT
CREATION**

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The development and the implications of advancement in digital technologies have also influenced the news media as the news generated by AI (Artificial Intelligence) is on its rise. The newer technology adoption leads AI driven tools to take part in the process of information gathering, production and news distribution. Advancement in technology has reshaped the news media in many aspects as the journalistic practices are experiencing a big transformation in adopting AI driven tools in the process of news production and dissemination (Jamil & Sadia, 2021). AI generated news anchors had been flooding among Indian news units, where the AI news anchor avatars narrated the news and weather statistics. This study mainly focuses on manifesting the factuality of the news generated by AI, circulated among the public creating reliability. Qualitative case study is equipped to examine and analyze few viral AI generated news stories across the globes that have resulted in social controversies.

Keywords: *Artificial Intelligence, AI Journalism, News Production, News Credibility*



ABSTRACT

DIGITAL TECHNOLOGY IN EDUCATION: IMPLICATIONS FOR TEACHING PRACTICES, STUDENT LEARNING, AND POLICY PERSPECTIVES

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The rapid diffusion of digital technologies has fundamentally reshaped educational systems worldwide. Technologies such as artificial intelligence (AI), adaptive learning platforms, learning analytics, and digital collaboration tools are increasingly embedded within teaching-learning processes, promising enhanced personalization, engagement, and accessibility. This paper synthesizes contemporary scholarly literature to critically examine the implications of digital technology for teaching practices, student learning outcomes, and educational policy, with particular attention to higher education and the Indian policy context. Using a systematic narrative review of peer-reviewed journals, policy reports, and authoritative secondary sources, the study analyses both opportunities and challenges associated with educational digitalization. Findings suggest that digital technologies can significantly improve learner engagement, enable adaptive and inclusive learning environments, and support data-informed decision-making; however, persistent challenges such as the digital divide, teacher preparedness, ethical concerns, and learner well-being constrain equitable implementation. The paper concludes by proposing policy-relevant recommendations and a future research agenda focused on sustainability, equity, and ethical governance of technology-enhanced education.

Keywords: *Digital Technology, Education, Artificial Intelligence, Adaptive Learning, Educational Policy*

MACHINE LEARNING TECHNIQUES FOR FEATURE EXTRACTION AND SELECTION FOR IMAGE RECOGNITION

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Feature extraction and feature selection play a crucial role in improving the accuracy, efficiency, and robustness of image recognition systems. With the rapid growth of high-dimensional image data, traditional handcrafted features often fail to capture complex visual patterns, leading to increased computational cost and reduced classification performance. This paper presents a comprehensive study of machine learning techniques employed for effective feature extraction and selection in image recognition tasks. Classical approaches such as Principal Component Analysis (PCA), Independent Component Analysis (ICA), and Linear Discriminant Analysis (LDA) are analyzed alongside modern learning-based methods, including convolutional neural networks (CNNs), auto encoders, and deep transfer learning models. For feature selection, both filter-based and wrapper-based techniques—such as mutual information, recursive feature elimination, and evolutionary algorithms—are explored to identify the most discriminative features while minimizing redundancy. Experimental evaluations demonstrate that the integration of deep learning-based feature extraction with optimized feature selection strategies significantly enhances recognition accuracy and reduces computational complexity. The study highlights the importance of hybrid machine learning frameworks in achieving scalable and reliable image recognition systems and provides insights into future research directions for efficient visual representation learning.



SELF-HEALING DISTRIBUTED FILE SYSTEM WITH AI OPTIMIZATION

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The exponential growth of big data and reliance on centralized servers has resulted in critical bottlenecks, single points of failure, and data inaccessibility during hardware malfunctions. Robust, self-healing storage architectures are necessary to address these challenges effectively. This paper presents Resilify, an AI-optimized Distributed File System (DFS) designed to maximize fault tolerance and retrieval efficiency in volatile network environments. The proposed system integrates Kademia Distributed Hash Table (DHT) protocols, Kubernetes orchestration, and Long Short-Term Memory (LSTM) machine learning models to enable secure, decentralized, and predictive data management. The architecture consists of three major components: the Kubernetes control plane for self-healing, worker nodes for computation, and an AI optimization service for traffic analysis. The React-based frontend allows users to manage files and visualize storage health, while backend services handle decentralized routing, real-time access logging, and dynamic replication based on predicted traffic spikes. A Cloud-Native DevSecOps methodology was adopted to ensure iterative improvements and system reliability through chaos engineering simulations. Experimental implementation demonstrated effective self-recovery from node failures and reduced latency through proactive auto-scaling. Resilify supports the advancement of autonomous cloud infrastructure by minimizing manual maintenance and ensuring high availability for Content Delivery Networks (CDNs) and enterprise archives.

Index Terms—*Distributed File System (DFS), Kademia DHT, Kubernetes, Self-Healing, Machine Learning, Predictive Replication, Cloud Infrastructure, Content Delivery Networks (CDNs).*

KINEMATIC DESIGN OF A LIGATURE-ACTUATED MORPHING WING FOR TUBE-LAUNCHED UNMANNED AERIAL VEHICLES

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Tube-launched unmanned aerial vehicles (UAVs) require wing deployment mechanisms that balance compact stowage, lightweight construction, and reliable actuation. Conventional spring-loaded or motor-driven systems introduce significant mass penalties and failure modes. This paper presents the kinematic design and analysis of a novel ligature-actuated morphing wing that combines tendon-driven deployment with compliant cellular truss architecture. The proposed mechanism utilizes a single-degree-of-freedom (DOF) reconfigurable linkage inspired by Sarrus deployable structures and spring origami bistable principles. Wing deployment is achieved through tensioning of a pre-routed ligature cable, which simultaneously actuates spanwise extension and sweep modification while eliminating the need for bulky torsional springs. Kinematic models based on Lagrangian mechanics are developed to predict deployment trajectories and actuation force requirements. A lockable "plug-in" mechanism provides positive retention in the deployed configuration. Results indicate that the ligature-actuated system reduces mechanism weight by approximately 35% compared to conventional spring-assisted systems while achieving full deployment within 0.8 seconds under representative aerodynamic loads. The proposed design offers a viable, low-complexity solution for next-generation tube-launched UAV platforms.

Keywords: *Morphing wing; Tube-launched UAV; Ligature actuation; Tendon-driven mechanism; Deployable structures; Kinematic analysis*



ABSTRACT

REDUCTION OF CARBON FOOTPRINT IN PRODUCTION SYSTEMS USING LEAN TOOLS

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The rapid expansion of industrial production has resulted in a significant rise in global carbon emissions, making sustainability a critical priority for manufacturing organizations. Production systems contribute substantially to greenhouse gas emissions due to high energy consumption, inefficient material usage, excessive inventory, machine idling, and process-related waste. Lean manufacturing, traditionally applied to improve productivity and operational efficiency, has recently emerged as an effective approach for reducing environmental impact. This paper presents a comprehensive analysis of how lean tools can be systematically applied to reduce the carbon footprint of production systems. The study integrates an extensive literature review, a structured research methodology, analytical tables, and graphical representations to examine the environmental benefits of lean tools such as Value Stream Mapping (VSM), 5S, Kaizen, Just-in-Time (JIT), Single Minute Exchange of Die (SMED), and Total Productive Maintenance (TPM). Results from multiple industrial sectors indicate that organizations can achieve carbon emission reductions ranging from 12% to 20% following lean implementation. The findings demonstrate that lean manufacturing offers a practical, scalable, and economically viable pathway toward sustainable and low-carbon production systems.

Keywords:- Carbon Footprint Reduction, Lean Manufacturing, Sustainable Production Systems, Green Manufacturing, Environmental Sustainability

ASSESSMENT OF STORAGE AND MARKET-ASSOCIATED FUNGAL FLORA IN MILLET GRAINS: IMPLICATIONS FOR FOOD SAFETY AND PUBLIC HEALTH

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Milletts constitute an important component of food security and nutritional sustainability, particularly in developing regions; however, their quality and safety are often compromised by fungal contamination during storage and market handling. The present study aims to assess the diversity of storage- and market-associated fungal flora in selected millet grains, namely bajra (*Pennisetum glaucum*), kodo (*Paspalum scrobiculatum*), and ragi (*Eleusine coracana*), with special reference to food safety and public health implications. Stored millet samples were collected from open markets and compared with freshly harvested grains. Fungal species associated with the millet samples were isolated using standard mycological techniques, followed by purification and identification based on morphological, cultural, and reproductive characteristics. Quantitative assessment was carried out by recording colony counts through visual observation and colony counter methods. The percentage frequency and abundance of occurrence of individual fungal species were calculated to determine their dominance and distribution patterns. Additionally, biochemical analyses were conducted to evaluate the extent of deterioration caused by fungal infestation in market-stored samples in comparison to freshly harvested millets. The findings of this study are expected to provide comprehensive insights into the mycoflora diversity associated with millets during post-harvest storage and marketing, highlighting potential risks related to grain quality deterioration and consumer health. The study will also contribute baseline data essential for developing effective storage practices and food safety interventions aimed at minimizing fungal contamination in millets.

Keywords: Millets, Mycoflora diversity, Fungal contamination, Storage fungi, Open markets, Biochemical deterioration, Food safety, Public health.



ABSTRACT

A SCALABLE DEEP NEURAL ARCHITECTURE FOR RUMOR AND NON-RUMOR CLASSIFICATION IN LARGE-SCALE SOCIAL MEDIA SYSTEMS

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The rapid proliferation of social media platforms has resulted in large-scale information diffusion, producing complex interaction networks and massive volumes of unstructured textual data. While such platforms enhance communication efficiency, they also accelerate the spread of rumors, which can distort public perception and undermine digital security. Accurate classification of rumor and non-rumor content at early diffusion stages remains a significant challenge in artificial intelligence and natural language processing research. This paper proposes a deep learning-based rumor detection framework using a B_LSTM_UCL (Bidirectional Long Short-Term Memory with User Credibility Learning) model. The architecture integrates bidirectional sequence modeling to capture contextual dependencies within textual data and a user credibility learning module to evaluate the trustworthiness of information sources. The B_LSTM component extracts semantic representations from both forward and backward contexts, while the UCL module incorporates behavioral attributes, interaction history, and network centrality measures to distinguish rumor propagation patterns from non-rumor diffusion. The proposed framework leverages NLP preprocessing, word embedding techniques, and diffusion-aware feature modeling to enhance rumor classification performance. Experimental results demonstrate that the B_LSTM_UCL model achieves superior Accuracy, Precision, Recall, and F1-score compared to traditional machine learning classifiers and standard LSTM-based approaches. The credibility-aware integration significantly improves discrimination between rumor and non-rumor content and reduces false rumor detection rates. The study contributes to AI and machine learning research by presenting a hybrid semantic-credibility architecture suitable for large-scale social media datasets. Furthermore, the framework supports scalable deployment in big data environments and strengthens cybersecurity mechanisms by mitigating rumor propagation in online ecosystems.

Keywords: Rumor Detection, B_LSTM_UCL, Bidirectional LSTM, User Credibility Learning, Information Diffusion, Natural Language Processing.

APPROXIMATION OF FUNCTION IN THE HOLDER METRIC BY PRODUCT MEANS OF FOURIER SERIES

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In this paper, we study the degree of approximation of periodic functions in the Hölder Metric by the $(E, q) (N, p_n)$ means of Fourier series. $(E, q) (N, p_n)$ means obtained as a product of Euler means and

generalized Nörlund means, is employed to improve the convergence behavior of Fourier series. Estimates for the degree of approximation are derived in terms of the modulus of continuity under suitable conditions on the sequence $\{p_n\}$ and the parameter q . The result is generalization of several known results.

Keywords: Hölder metric, Fourier series, degree of approximation, (E, q) means, (N, p_n) means, $(E, q) (N, p_n)$

means.



ABSTRACT

CROSS-CULTURAL MANAGEMENT AND LEADERSHIP EFFECTIVENESS

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The rapid growth of social media platforms has generated massive volumes of real-time, user-generated data, offering valuable insights into public opinions, behaviors, and emerging trends. Trend prediction using social media data analytics has become an essential tool for organizations, policymakers, and researchers to anticipate changes in consumer preferences, market dynamics, and societal patterns. This study focuses on analyzing social media data to identify, model, and predict emerging trends by leveraging data analytics, machine learning, and natural language processing techniques. The research examines methods for data collection, preprocessing, sentiment analysis, topic modeling, and time-series forecasting to extract meaningful patterns from large-scale social media datasets. Additionally, the study addresses challenges such as data noise, bias, privacy concerns, and ethical data usage. By integrating predictive modeling with real-time analytics, the proposed approach aims to improve the accuracy and timeliness of trend prediction across domains such as marketing, public opinion analysis, and decision support systems. The outcomes of this research are expected to contribute to more informed strategic planning and data-driven decision-making in dynamic digital environments.

Keywords: *Trend Prediction, Social Media Analytics, Big Data, Machine Learning, Sentiment Analysis, Data Mining, Time-Series Forecasting, Predictive Analytics, Ethical Data Usage*

**A CASE STUDY ON SOLID-WASTE MANAGEMENT IN BILASPUR CITY,
CHHATTISGARH**

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Solid waste management (SWM) has recently become a serious concern for the environment as well as public health in rapidly developing Indian cities. Bilaspur City, an important administrative and business hub in the state of Chhattisgarh, is witnessing substantial growth in the generation of municipal solid waste (MSW) due to population growth, urbanization, changes in consumption patterns, and economic development. This paper provides a detailed analysis of the current solid waste management system in Bilaspur City, assessing the generation of waste, its composition, collection efficiency, segregation, transportation, and disposal practices. The primary data was collected through field surveys, waste characterization, and interviews, whereas secondary data was collected from the municipal records. The results show that Bilaspur produces around 300-450 tons of waste per day, and per capita waste generation varies from 0.4 to 0.6 kg/day. Organic waste contributes around 55-60% to the total waste, followed by recyclables (25-30%), inert, and small amounts of hazardous waste. Even with such a high percentage of biodegradable waste, the lack of processing infrastructure leads to the disposal of mixed waste at the landfill sites. The paper lists the major challenges, which include the lack of collection coverage in peri-urban zones, the absence of scientific landfill sites, inadequate transportation infrastructure, the weak enforcement of SWM Rules, 2016, and the lack of public engagement in waste segregation. Environmental issues such as open dumping, leachate migration, and waste burning further contribute to the risks of air, soil, and water pollution. In this context, the paper proposes an integrated strategy that focuses on mandatory source segregation, decentralized composting, material recovery facilities, public-private partnerships, and community engagement initiatives. Building the capacity of institutions and applying the principles of a circular economy can greatly help in improving waste governance. The paper concludes that sustainable and participatory approaches to SWM are necessary for improving environmental conditions and making Bilaspur City resilient.

Keywords: *Solid-Waste Management; Bilaspur; Municipal Solid Waste; Waste Segregation; Composting; Recycling; Sustainable Urban Management; Waste Policy; Sanitary Landfill*



ABSTRACT

**SEWAGE SLUDGE MANAGEMENT CHALLENGES IN BILASPUR,
CHHATTISGARH**

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Rapid urbanization and population increase in Bilaspur, Chhattisgarh, have contributed to increased generation of wastewater, thereby aggravating the problems related to the management of sewage sludge. Sewage sludge, a semi-solid substance produced during wastewater treatment, is rich in organic materials, nutrients, pathogens, and trace heavy metals. It can cause severe environmental and health hazards if not properly treated and disposed of. The study critically evaluates the present scenario of sewage sludge management in Bilaspur, identifying technical, environmental, institutional, and socio-economic factors that impede effective sludge handling and disposal. The study examines sludge production trends in the context of the growing sewage treatment infrastructure and wastewater inflow. It is estimated that with every 1,000 m³ of wastewater treated, there is a production of 40-60 kg of dry sludge solids, which puts immense pressure on the existing infrastructure. The study indicates that there are constraints in sludge stabilization, dewatering, and disposal, as well as irregularities in desludging services and lack of enforcement of regulations. Open dumping, land spreading without treatment, and dumping near water bodies contribute to the risks to the Arpa River ecosystem. The report identifies major hurdles, such as a lack of treatment capacity, the absence of advanced digestion facilities, financial limitations, a fragmented governance system, and a lack of public awareness. The proper implementations of integrated sludge management practices can help convert sewage sludge from a source of pollution to a resource, which will help in improving the sanitation of Bilaspur.

Keywords: *Sewage Sludge Management; Wastewater Treatment; Urban Sanitation; Resource Recovery; Anaerobic Digestion; Environmental Pollution; Bilaspur; Public Health*

**SUSTAINABLE URBAN HABITATS AND URBAN WATER SUPPLY: A CASE STUDY
OF BENGALURU CITY, INDIA**

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The pressures on urban water resources have been aggravated by the rapid rate of urbanization, especially in the rapidly expanding metropolitan cities of the Global South. A sustainable urban environment demands a holistic strategy that integrates the principles of environmental sustainability, economic viability, and social equity, with water security being the core component of sustainability. This paper investigates the urban water supply system in Bengaluru, India, which is a rapidly expanding metropolitan city with severe water stress. Bengaluru, with a population of over 12 million, has been transformed into an IT and education destination, which has substantially raised the demand for residential, commercial, and industrial water use. Bengaluru is heavily dependent on surface water from the Cauvery River, which is transported over long distances, and also on groundwater extraction through bore wells. Based on the framework of Integrated Water Resource Management (IWRM), this study examines the institutional, infrastructural, and environmental aspects of water sustainability. This study also emphasizes the environmental impacts of wetland encroachment, poor wastewater treatment, and loss of greenery. However, Bengaluru shows encouraging sustainability efforts such as the implementation of rainwater harvesting, decentralized wastewater treatment and reuse, smart metering, leak detection systems, and community-driven lake restoration initiatives like Nagavara and Kaikondarahalli. These efforts show the effectiveness of integrating technological innovation with nature-based solutions and people-centered governance. This paper concludes that for sustainable urban water management in Bengaluru, there is a need for enhanced institutional coordination, increased decentralized systems, just and equitable distribution systems, and climate-resilient infrastructure planning.

Keywords: *Sustainable Urban Habitats; Urban Water Supply; Integrated Water Resource Management (IWRM); Water Security; Groundwater Depletion; Rainwater Harvesting; Decentralized Wastewater Treatment; Bengaluru City*



ABSTRACT

**GREYWATER TREATMENT AND REUSE FOR SUSTAINABLE WATER
MANAGEMENT IN BILASPUR CHHATTISGARH**

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The growing need for water and urbanization are increasing the stress on medium-sized Indian cities' freshwater resources. Bilaspur, Chhattisgarh, which has not been considered a water-stressed area in the past, is facing seasonal water shortages, groundwater exhaustion, and poor wastewater management practices because of the fast-growing residential and institutional sectors. Greywater treatment and reuse have emerged as a promising decentralized approach to improve the sustainability of urban water management. This paper assesses the feasibility of greywater recycling as an additional water management option for Bilaspur. Greywater, produced from baths, showers, laundry, and wash basins, accounts for about 60-70% of the total domestic wastewater. Greywater has been found to contain moderate organic loads (BOD and COD), suspended solids, detergents, and nutrients, but relatively lower pathogen loads compared to blackwater, thus making it amenable to decentralized treatment and reuse. The study evaluates conventional and nature-based treatment technologies, such as sedimentation, sand filtration, anaerobic baffled reactors, and constructed wetlands. Based on the climatic and land availability factors in Bilaspur, low-cost decentralized treatment systems like reed bed and biofiltration systems have been found to be technically and economically viable.

Keywords: *Greywater Reuse; Sustainable Water Management; Decentralized Wastewater Treatment; Constructed Wetlands; Urban Water Security; Bilaspur; Water Conservation; Climate-Resilient Cities*

**AN IMPACT OF INDUSTRIAL EFFLUENTS ON GROUNDWATER QUALITY OF
SILTARA INDUSTRIAL AREA, RAIPUR, (C.G)**

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Groundwater is a major source of drinking and irrigation water in the industrial and peri-urban areas of Chhattisgarh. The Siltara Industrial Area, situated near Raipur city, has witnessed fast industrialization over the last two decades, leading to an augmentation in the disposal of untreated and semi-treated effluents into the environment. The current study evaluates the effect of industrial effluents on groundwater quality in the Siltara Industrial Area by analyzing important physicochemical and heavy metal variables and comparing them with the Bureau of Indian Standards (BIS) and World Health Organization (WHO) standards. Groundwater samples were collected from twelve important locations representing high-impact areas around the disposal points of effluents, transition areas, and distant points unaffected by the industries. The sampling was done during the pre-monsoon and post-monsoon periods to account for seasonal variations. The important variables analyzed were pH, electrical conductivity (EC), total dissolved solids (TDS), hardness, nitrates, phosphates, biological oxygen demand (BOD), chemical oxygen demand (COD), and important heavy metals such as lead (Pb), chromium (Cr), cadmium (Cd), and nickel (Ni). The findings show a marked deterioration in the quality of groundwater in the regions around the discharge points of industrial effluents. High EC (upto 2500 μ S/cm), TDS (upto 1800 mg/L), and hardness values were recorded, which are above the permissible limits for drinking water. The heavy metal concentrations, especially lead and chromium, exceeded the standard values in some samples, which is a cause of concern for long-term health hazards. The high nitrate and phosphate values also indicate contamination due to industrial and other anthropogenic factors. The conclusion is that the industrial effluents have adversely affected the groundwater quality in the Siltara Industrial Area, which is a serious hazard to human health, agricultural productivity, and environmental sustainability. There is an urgent need to adopt stringent effluent treatment practices, monitor groundwater quality, and adopt environmentally sustainable industrial wastewater management strategies.

Keywords: *Industrial Effluents; Groundwater Quality; Heavy Metals; Siltara Industrial Area; Water Pollution; Raipur; Sustainable Water Management; Environmental Impact*



ABSTRACT

**FLUORIDE RISK ASSESSMENT AND MANAGEMENT STRATEGIES FOR
DRINKING WATER IN JANJGIR–CHAMPA DISTRICT, CHHATTISGARH**

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Fluoride contamination in groundwater is a major public health concern in several regions of India, particularly in semi-arid and alluvial aquifer systems. Janjgir–Champa district of Chhattisgarh has reported elevated fluoride concentrations in drinking water sources, posing risks of dental and skeletal fluorosis among rural populations dependent on groundwater. Groundwater samples were collected from tube wells and hand pumps across selected villages representing different hydrogeological settings. Fluoride concentration was analyzed using ion-selective electrode methods, and results were compared with Bureau of Indian Standards (BIS 10500:2012) and World Health Organization (WHO) guidelines (1.0–1.5 mg/L permissible limit). Risk assessment was conducted using hazard quotient (HQ) calculations for different age groups, considering daily water intake and body weight variations. The study recommends a multi-tiered management strategy including installation of community-based defluoridation units (activated alumina, Nalgonda technique), promotion of rainwater harvesting, blending of high- and low-fluoride water sources, periodic groundwater monitoring, and public awareness programs on safe water consumption. Policy-level interventions and integration with national drinking water programs are also emphasized. Effective fluoride mitigation strategies are essential to ensure safe drinking water access, reduce health risks, and promote sustainable water resource management in Janjgir–Champa district.

Keywords: *Fluoride contamination; Groundwater quality; Risk assessment; Hazard quotient; Janjgir–Champa district; Defluoridation; Drinking water management; Fluorosis.*

**ETHICAL IMPLICATIONS OF DEEPPAKE IMAGE GENERATION AND
DETECTION**

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The rapid advancement of deep learning and generative artificial intelligence has led to the widespread creation of deepfake images that closely resemble authentic visual content. While such technologies offer significant benefits in creative industries and digital innovation, they simultaneously pose serious ethical, social, and legal challenges. Deepfake images have the potential to facilitate misinformation, identity fraud, reputational harm, and erosion of public trust in digital media. This research examines the ethical implications of deepfake image generation and detection, with a focus on issues of consent, privacy, bias, accountability, and transparency. The study critically analyzes existing deepfake generation techniques and machine learning–based detection models to assess their ethical limitations and societal impact. Furthermore, it explores the role of explainable artificial intelligence (XAI) and responsible AI frameworks in enhancing the trustworthiness and fairness of deepfake detection systems. By integrating technical evaluation with ethical and regulatory perspectives, the research aims to propose guidelines for responsible development, deployment, and governance of deepfake technologies. The outcomes of this study are expected to support policymakers, researchers, and industry stakeholders in mitigating the risks associated with deepfake imagery while promoting ethical AI practices in digital ecosystems.

Keywords: *Deepfake Images, Ethical Artificial Intelligence, Machine Learning, Image Forgery Detection, Digital Forensics, Explainable AI, Privacy and Consent, Bias and Fairness, Responsible AI Governance*



ABSTRACT

**THE INFLUENCE OF SOCIAL MEDIA ADVERTISING ON IMPULSIVE AND
COMPULSIVE BUYING BEHAVIOR AMONG GENERATION Z CONSUMERS IN
INDIA'S APPAREL INDUSTRY**

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The explosive growth of digital platforms has transformed consumer buying habits, particularly among Generation Z in India's apparel sector. This study explores the psychological and behavioral drivers of impulsive and compulsive purchasing, emphasizing the role of social media advertising. Guided by the Stimuli-Organism-Response (SOR) Model, the research investigates how social media exposure, peer pressure, influencer credibility, and perceived ease of online shopping shape unplanned buying tendencies. A quantitative design was employed, with data collected from 374 Generation Z consumers across diverse demographic profiles using convenience and snowball sampling methods. Online survey was disseminated via popular social media platforms provided the dataset for analysis. Findings reveal that social media advertising significantly influences both impulsive and compulsive buying, with fear of missing out (FOMO), hedonic browsing, and influencer reputation emerging as strong predictors. Peer pressure and personalized advertising were found to mediate the relationship between social media exposure and buying behavior. The study highlights the growing emotional and psychological impact of digital marketing strategies on young consumers and offers insights for apparel brands to design ethically responsible yet engaging campaigns.

Keywords: *Social Media Advertising, Generation Z, Impulsive Buying, Compulsive Buying, Apparel Industry, Stimuli-Organism-Response (SOR) Model.*

BRAIN STROKE PREDICTION USING MACHINE LEARNING ALGORITHMS

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Brain stroke is one of the leading causes of death and long-term disability worldwide. Early identification of high-risk individuals can significantly reduce mortality and improve patient outcomes. With the advancement of Artificial Intelligence (AI), machine learning (ML) techniques have emerged as powerful tools in medical diagnosis and predictive healthcare analytics. This research paper presents a theoretical study on brain stroke prediction using various machine learning classification techniques. The study discusses structured healthcare datasets, preprocessing techniques, feature selection methods, and comparative analysis of commonly used algorithms such as Logistic Regression, Decision Tree, Support Vector Machine (SVM), K-Nearest Neighbor (KNN), and Random Forest. Based on theoretical evaluation and literature evidence, Random Forest is identified as a highly efficient algorithm due to its ensemble learning capability and improved generalization performance. The paper highlights the role of predictive modeling in assisting healthcare professionals for early stroke detection and preventive intervention.

Keywords—*Brain Stroke, Machine Learning, Random Forest, Classification, Healthcare Analytics, Predictive Modeling, Artificial Intelligence.*



ABSTRACT

**FROM CULTURAL HERITAGE TO LEGAL RIGHTS: A CRITICAL AND
COMPARATIVE ANALYSIS OF TRADITIONAL CULTURAL EXPRESSION IN
CHHATTISGARH**

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India as a nation is blessed with culture and diversity. Every state has its own unique cultural practices. These cultural practices are tangible and intangible in nature such as painting, cuisines, folklore, folk dances, etc. These cultural practices give identity to the community and people who have kept them alive since ages. These practices are not only classically rich but have also provided identity to the community. The State of Chhattisgarh is a young state formed in year 2000. The state has its identity with kosa silk, bastar handicrafts, raut dance, etc. Traditional, cultural and expressions (TCE) is the vast range of indigenous creative expressions such as music, folklore, dance, art, rituals, symbols and traditional knowledge. They form the cultural identity of a region they are associated with. Thus, safeguarding TCE is a way to protect as well as secure the cultural identity of a region and nation as a whole. In India, Intellectual Property Rights (IPRs) are protected through many legislations such as Copyright Act, Trade Marks Act, Geographical Indication, Patent Act, etc. The Copyright Act, 1957 protects original literary, dramatic, artistic work and the Geographical Indication (Registration and Protection) Act, 1999 protect unique goods originating from a geographical location. These two laws are considered in dealing with TCE; however, the protection is indirect, fragmented and limited. This paper focuses on the Traditional, cultural and expression of the State of Chhattisgarh and critically examines the legal framework for their protection, and draws the comparative insights from other jurisdictions.

Keywords- *Traditional Cultural expression, Intellectual Property Rights, Legal Protection, Comparative Jurisdiction and State of Chhattisgarh.*

ASSESSMENT OF PHYSICO CHEMICAL PARAMETERS OF TREATED WATER

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Through physicochemical research, this study sought to assess the overall quality of treated water and ascertain its suitability for industrial and drinking uses. Key water quality parameters, such as pH, total dissolved solids, turbidity, total hardness, calcium hardness, chloride, sulphate, residual chlorine dioxide, and alkalinity, were measured as part of the assessment. The results were then compared with widely recognized standards for the use of potable and industrial water. The findings show that the majority of metrics are within allowable bounds, indicating good water clarity and efficient treatment performance. A pH of 5.6 indicates somewhat acidic conditions, which are still acceptable for human consumption but, if improperly managed, could raise the danger of corrosion in plumbing systems. With a turbidity of 0.16 nephelometric turbidity units and a total dissolved solids concentration of 44.8 mg/liter, the results show effective filtration and few dissolved contaminants. Scale formation in boilers, heaters, and distribution systems is less likely when the water has low total hardness and calcium hardness readings, which attest to its softness. The residual quantities of sulphate and chlorine dioxide are within safe limits, indicating proper chemical balance and disinfection. Nonetheless, the amounts of alkalinity and chloride, both of which are measured at 250 mg/liter, are somewhat high; high alkalinity improves buffering capacity but may encourage scale in specific circumstances, while high chloride may alter flavor and cause corrosion over time. To sum up, the treated water is generally of good quality and appropriate for its intended applications; nevertheless, to guarantee long-term system stability and infrastructure preservation, routine monitoring and small adjustments, particularly to pH, chloride, and alkalinity are advised.

Keywords: *Treated water, turbidity, hardness, chloride, sulphate, pH.*



ABSTRACT

**SUPPORT VECTOR MACHINE-BASED INTRUSION DETECTION
SYSTEMS: A COMPREHENSIVE SURVEY ON KERNEL FUNCTIONS AND
OPTIMIZATION STRATEGIES**

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IDS is an important instrument that ensures the security of contemporary networks against emerging cyber attackers. The IDS models based on Support Vector Machine (SVM) have received great attention because of the excellent theoretical reasons, the ability to generalize and performance in the high-dimensional data setting. It is a survey of the intrusion detection systems based on SVMs, including the review of its kernel functions, the optimization of hyperparameters, the benchmark datasets, and the metrics of its performance. The paper compares the effect of Linear, Polynomial, Radial Basis Function (RBF) and Sigmoid kernels and methodologies of optimization, including Grid Search, Random Search, Bayesian Optimization, and evolutionary algorithms. The comparative study has revealed the significance of kernel choice and clever parameter selection in enhancing detection accuracy and minimizing false alarm. In addition, gaps in research and future directions such as hybrid SVM deep learning model and federated IDS architecture are given in order to drive emerging developments in scalable and adaptable cybersecurity measures.

Keywords: *Intrusion Detection System, Support Vector Machine, Kernel Functions, Hyperparameter Optimization, Cybersecurity, Machine Learning.*

**ENHANCING USER EXPERIENCE IN HUMAN – COMPUTER INTERACTION (HCI)
USING INTELLIGENT AND ADAPTIVE INTERFACES**

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Human–Computer Interaction (HCI) focuses on designing interactive systems that improve usability, accessibility, and overall user satisfaction. With rapid advancements in artificial intelligence and data analytics, intelligent and adaptive interfaces have emerged as a transformative approach to enhancing user experience. These interfaces dynamically respond to user behavior, preferences, and contextual information, enabling more personalized and efficient interactions. By leveraging machine learning, predictive modeling, and real-time feedback mechanisms, adaptive systems can reduce cognitive load, improve task performance, and create more intuitive digital environments. This paper explores the role of intelligent and adaptive interfaces in modern HCI, highlighting their design principles, benefits, and challenges. It also examines how personalization, context awareness, and automation contribute to more responsive and user-centered computing systems. The study emphasizes that integrating adaptive intelligence into interface design is a key step toward creating seamless and meaningful human–technology interactions.



ABSTRACT

**A MACHINE LEARNING – VISION SURGICAL ASSISTANCE
HEALTH CARE AND BIOMEDICAL {ROBOTICS + MACHINE LEARNING}**

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Minimally invasive and robot-assisted surgeries produce extensive intraoperative video data that can be leveraged to enhance surgical safety, workflow efficiency, and decision support. However, most existing systems rely heavily on manual monitoring and lack intelligent contextual awareness. This paper proposes a real-time vision-based surgical assistance framework that integrates deep spatial-temporal deep learning models for surgical instrument detection and phase recognition. The proposed system combines a lightweight object detection network for precise localization and tracking of surgical tools with a transformer-based temporal architecture to model long-range dependencies in surgical video sequences. To address the challenge of limited annotated medical datasets, a self-supervised pretraining strategy is incorporated, enabling the model to learn robust feature representations from unlabeled surgical videos before fine-tuning on labeled benchmarks. The framework is evaluated using publicly available datasets, including Cholec80 and EndoVis Challenge Dataset. Performance is assessed using mean Average Precision (mAP) for tool detection and F1-score and accuracy metrics for phase classification. Experimental results demonstrate that the proposed approach outperforms conventional CNN and CNN-LSTM baselines while maintaining real-time inference speeds suitable for deployment in robotic surgical platforms. To improve transparency and clinical trust, explainability techniques such as Grad-CAM are integrated to visualize salient regions influencing model predictions, enabling validation of anatomical relevance. The proposed framework provides a scalable and computationally efficient solution for context-aware surgical assistance. By combining real-time vision, temporal modeling, and interpretability, this research contributes toward the development of intelligent, semi-autonomous robotic systems capable of enhancing intraoperative decision-making and improving patient safety in minimally invasive surgical procedures.

**FORECASTING IRON ORE PRICES USING HYBRID ENSEMBLE MODELS: A
DEEP LEARNING APPROACH**

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Iron ore price dynamics exhibit nonlinear adjustment, volatility clustering, and regime-dependent structural breaks arising from supply concentration and industrial demand cycles. Linear statistical models capture deterministic trend persistence but degrade under nonlinear shock propagation. Deep recurrent architectures model long-range dependencies yet introduce parameter variance and regime sensitivity. Hybrid ensemble frameworks integrate complementary forecasting mechanisms to balance bias and variance. This review synthesizes statistical, machine learning, and deep learning approaches applied to commodity price forecasting, with emphasis on iron ore markets. Mathematical formulation, volatility implications, forecast error propagation, and ensemble variance decomposition are examined. Structural limitations and unresolved research challenges are discussed with reference to economic decision relevance.

Index Terms: *Iron ore forecasting, ARIMA, Holt Winters, LSTM, ensemble learning, volatility clustering, commodity markets.*



ABSTRACT

ROLE OF HUMANITIES IN SUSTAINABLE DEVELOPMENT

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This study examines the important role that the humanities play in environmental preservation initiatives. Although scientific studies and technological developments are important, the humanities provide special viewpoints and insights into the interactions between humans and the environment, moral issues, and cultural elements that affect conservation attitudes and actions. Examining literature, philosophy, the arts, and the social sciences, the study demonstrates how the humanities promote sustainable behaviors, raise environmental awareness, and motivate group action for a more peaceful coexistence with the natural world. Through acknowledging the interdependence of human society and the environment, the humanities open the door for interdisciplinary cooperation and comprehensive methods to tackle intricate environmental issues. A sustainable future that prioritizes ecological integrity and human well-being requires embracing the important role of the humanities. The humanities encompass the exploration of various cultures and traditions, including indigenous knowledge systems concerning environmental preservation. Gaining insight into and safeguarding traditional practices and wisdom can provide sustainable solutions and frameworks for harmony with nature, enhancing conservation strategies. The humanities are vital to environmental education, captivating learners through narratives, art, and methods rooted in the humanities. By incorporating the humanities into environmental education, we foster empathy and environmental awareness, enabling individuals to make knowledgeable choices and engage in conservation activities. In light of the environmental challenges India faces and its pursuit of a sustainable future, incorporating the humanities into environmental education and advocacy is crucial. By fostering empathy, critical thinking, and a richer understanding of environmental matters, the humanities can play a pivotal role in promoting positive change, leading to a greener and more harmonious relationship with nature in India. The lasting influence of the humanities in environmental conservation highlights the importance of interdisciplinary strategies for tackling the multifaceted environmental issues of the 21st century.

Keywords: *Humanities, Environmental Conservation, Literature, Philosophy, Arts, Social Sciences.*

BITCOIN: ARCHITECTURE, SECURITY, SCALABILITY AND ECONOMIC IMPACT

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Bitcoin is the first decentralized cryptocurrency, introduced in 2008 by Satoshi Nakamoto as a peer-to-peer electronic cash system. Built on blockchain technology, Bitcoin eliminates the need for centralized financial intermediaries by leveraging cryptographic principles, distributed consensus, and economic incentives. This paper examines Bitcoin's underlying architecture, including its blockchain structure, cryptographic mechanisms, and Proof-of-Work (PoW) consensus protocol. It further analyzes key security aspects such as resistance to double-spending and 51% attacks, along with privacy limitations. Scalability challenges—including transaction throughput constraints and block size limitations—are explored, with particular attention to Layer-2 solutions such as the Lightning Network. Additionally, the paper evaluates Bitcoin's broader economic implications, including its role as digital gold, market volatility, and environmental concerns associated with mining viability.



DESIGN AND DEVELOPMENT OF LOW-COST NEUROMORPHIC COMPUTING SYSTEMS FOR BRAIN-COMPUTER INTERFACES

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Neuromorphic computing is an emerging paradigm inspired by the structure and functioning of the human brain. Unlike traditional von Neumann computing architectures, neuromorphic systems use spiking neural networks (SNNs), event-driven processing, and parallel computation to achieve high energy efficiency and low latency. Brain-Computer Interfaces (BCIs) enable direct communication between the brain and external devices by decoding neural signals such as EEG. However, conventional BCI systems are often expensive, power-hungry, and dependent on high-performance processors, limiting their accessibility and portability. This research focuses on the design and development of a low-cost neuromorphic computing system for Brain-Computer Interface applications. The proposed system integrates affordable hardware components, including low-power microcontrollers and FPGA-based accelerators, with spike-based neural processing models to perform real-time EEG signal classification. The methodology includes signal preprocessing, spike encoding, SNN-based feature extraction, and hardware deployment. Performance is evaluated using metrics such as classification accuracy, power consumption, latency, and overall hardware cost. Experimental results demonstrate that the neuromorphic prototype significantly reduces energy consumption and system latency while maintaining competitive accuracy compared to traditional machine learning-based BCI systems. The findings suggest that low-cost neuromorphic architectures can enable scalable, wearable, and energy-efficient BCI solutions for healthcare, assistive technology, and human-machine interaction. This work highlights the potential of neuromorphic computing to democratize brain-based technologies and expand their practical applications in real-world environments.

AUTOMATED LUNG NODULE DETECTION IN CT SCANS USING METHODS AND TECHNIQUES

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Lung cancer remains one of the leading causes of cancer-related deaths worldwide, primarily due to late diagnosis. Early detection of pulmonary nodules through Computed Tomography (CT) imaging significantly improves survival rates. However, manual examination of CT scans is time-consuming and subject to inter-observer variability. This research paper presents an automated lung nodule detection system using deep learning techniques, particularly Convolutional Neural Networks (CNNs) and 3D segmentation models. The proposed framework includes preprocessing, lung segmentation, candidate nodule detection, false-positive reduction, and classification. Publicly available datasets such as LIDC-IDRI are utilized for validation. Experimental results demonstrate improved sensitivity and reduced false positives compared to traditional machine learning approaches.



ABSTRACT

**APPROXIMATION OF ALMOST LIPSCHITZ FUNCTION BY MEANS OF
CONJUGATE FOURIER SERIES**

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In this paper, we study the error approximation of periodic functions in the almost Lipschitz function by the means of Fourier series. Almost Lipschitz functions form an important generalization of classical Lipschitz classes and provide a flexible framework for studying smoothness conditions weaker than uniform Lipschitz continuity. means provide a better rate of convergence compared to individual summability methods under appropriate conditions on the sequences and the parameter q .

Keywords: *Almost Lipschitz function, Fourier series, Conjugate Fourier series, Degree of approximation, means, means, means.*

TREND PREDICTION USING SOCIAL MEDIA DATA ANALYTICS

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The rapid growth of social media platforms has generated massive volumes of real-time, user-generated data, offering valuable insights into public opinions, behaviors, and emerging trends. Trend prediction using social media data analytics has become an essential tool for organizations, policymakers, and researchers to anticipate changes in consumer preferences, market dynamics, and societal patterns. This study focuses on analyzing social media data to identify, model, and predict emerging trends by leveraging data analytics, machine learning, and natural language processing techniques. The research examines methods for data collection, preprocessing, sentiment analysis, topic modeling, and time-series forecasting to extract meaningful patterns from large-scale social media datasets. Additionally, the study addresses challenges such as data noise, bias, privacy concerns, and ethical data usage. By integrating predictive modeling with real-time analytics, the proposed approach aims to improve the accuracy and timeliness of trend prediction across domains such as marketing, public opinion analysis, and decision support systems. The outcomes of this research are expected to contribute to more informed strategic planning and data-driven decision-making in dynamic digital environments.

Keywords: *Trend Prediction, Social Media Analytics, Big Data, Machine Learning, Sentiment Analysis, Data Mining, Time-Series Forecasting, Predictive Analytics, Ethical Data Usage*



AI PRODUCT ADS GENERATOR

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In the modern era of digital marketing, creating engaging and visually appealing product advertisements requires significant time, creativity, and technical expertise. The AI Product Ads Generator project aims to revolutionize this process by leveraging artificial intelligence to automatically generate advertisement videos from a single product image and minimal user input. The system integrates various AI-driven modules — including image analysis, Natural Language Processing (NLP) for ad script generation, Text-to-Speech (TTS) for audio synthesis, and AI-based video rendering — to produce a professional-quality promotional video within minutes. The core functionality of the system lies in its ability to interpret visual product features and transform them into persuasive marketing content. Using deep learning models and pre-trained AI frameworks such as OpenAI CLIP, Text-to-Video synthesis, and voice generation models, the system creates natural and contextually relevant advertisements. The core functionality of the system lies in its ability to interpret visual product features and transform them into persuasive marketing content. Using deep learning models and pre-trained AI frameworks such as OpenAI CLIP, Text-to-Video synthesis, and voice generation models, the system creates natural and contextually relevant advertisements. The AI Product Ads Generator represents a step toward the future of automated marketing — a domain where creativity meets intelligence. By combining advanced machine learning algorithms with intuitive design principles, this system establishes a foundation for next-generation ad creation platforms that are faster, smarter, and more adaptive to user needs. In conclusion, the AI Product Ads Generator demonstrates how AI can bridge the gap between technology and creativity, enabling businesses and individuals to produce compelling digital advertisements efficiently.

Keywords: *Product ads generator, AI image, video generator, avatar generator, OpenAI, Advertisement*

COAL OVERBURDEN USED IN THE CONSTRUCTION INDUSTRY FOR SUSTAINABLE DEVELOPMENT: A REVIEW

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Coal mining generates huge quantities of overburden material consisting of soil, rock fragments, shale, sandstone, and clay. Traditionally, this material has been disposed of in dumps, causing land degradation, environmental pollution, and safety hazards. Recently, coal overburden has gained attention as a potential secondary raw material for construction applications such as aggregates, bricks, concrete, pavements, and geotechnical structures. This review paper summarizes the characteristics, utilization techniques, engineering performance, environmental benefits, and challenges associated with coal overburden use in the construction industry. The study highlights that the reuse of coal overburden supports sustainable development by conserving natural resources, reducing waste disposal problems, and promoting circular economy practices. In opencast mining, the topsoil is removed, and the broken rock is piled up as overburden. These waste products are left behind, take up a lot of space, and generally deteriorate the quality of the soil. The depth of soil covering a certain bearing stratum or rock. For building, an unwanted top layer of rock, gravel, or other practical material is desired. The material that lies above an area that lends itself to economical exploitation, such as the rock, soil, and ecology that lies above a coal seam or ore body, is referred to as overburden in the mining industry. During reclamation, an exhausted mining site may also be restored using overburden. In open-pit mining, managing overburden is essential to successful reclamation. The main obstacles for a sizable limestone quarry with a substantial thickness of overburden are transportation, dumping, slope stability, and groundwater interactions. The optimal techniques for excavation, transportation, and disposal including dumping in a flooded pit were determined using a multidisciplinary approach.

Keywords: *Coal overburden, construction materials, sustainable development, circular economy.*



CYBER SECURITY APPROACHES TO PREVENT MALWARE AND VIRUS ATTACKS

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In the current digital era, cyber security has emerged as one of the most critical issues owing to the exponential rise in the number of malware and virus attacks. Malware, comprising viruses, worms, ransomware, spyware, and trojans, is designed to harm systems, steal confidential data, and cause disruptions. With the rising adoption of the internet, cloud technology, and smart devices, cyber threats are becoming more sophisticated and hard to trace. Organizations, as well as individuals, are incurring severe losses owing to these cyber attacks.

This paper provides an insight into the various types of malware attacks, their functioning, and the effects caused on information systems. In addition to this, the paper also provides information on various attack methods, including phishing, social engineering, and zero-day attacks. Furthermore, the paper provides information on the latest methods of detection and prevention of malware attacks, including machine learning-based threat detection, firewalls, antivirus software, and intrusion detection systems. Real-life cases are also analyzed to understand the spread of malware attacks and how security can prevent them.

Keywords— *Cyber Security, Malware, Virus Attacks, Ransomware, Phishing, Intrusion Detection, Machine Learning in Security, Network Security, Data Protection, Cyber Threats.*

ENHANCEMENT OF BIOAVAILABILITY OF POORLY WATER-SOLUBLE DRUGS USING NANOTECHNOLOGY-BASED DRUG DELIVERY SYSTEMS

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Poor aqueous solubility remains a major challenge in modern drug development and formulation design. A significant number of newly discovered drug molecules exhibit low solubility in water, which limits their dissolution and absorption, ultimately resulting in poor bioavailability. In many cases, higher doses are required to achieve the desired therapeutic effect, which may increase the risk of adverse drug reactions and compromise patient safety. Therefore, improving the solubility and bioavailability of such drugs has become an important focus in pharmaceutical research. In recent years, nanotechnology-based drug delivery systems have emerged as a promising approach to address solubility-related issues. Reduction of drug particle size to the nanoscale increases surface area and enhances dissolution rate, leading to improved absorption and therapeutic effectiveness. Various nanocarriers, including liposomes, polymeric nanoparticles, solid lipid nanoparticles, and nanoemulsions, have demonstrated significant potential in improving drug solubility and enabling controlled and targeted drug delivery. These advanced delivery systems are particularly beneficial in the treatment of diseases such as cancer and tuberculosis, where precise and effective drug delivery is essential. In addition to improving pharmacokinetic properties, nanotechnology-based formulations may also enhance patient compliance by reducing dosing frequency and minimizing side effects. Despite these advantages, several challenges remain in the large-scale application of nanotechnology in pharmaceuticals. Issues related to safety evaluation, high production costs, regulatory requirements, and manufacturing complexities must be carefully addressed. This paper discusses the role of nanotechnology in enhancing the bioavailability of poorly water-soluble drugs and examines both its potential benefits and existing limitations in pharmaceutical development.

Keywords: *Nanotechnology, Bioavailability enhancement, Poorly water-soluble drugs, Nanocarriers, Targeted drug delivery, Pharmaceutical research therapeutic effect, liposome*



ABSTRACT

**CLINICAL TRIAL ETHICS: A HUMANISTIC VIEWPOINT ON INFORMED
CONSENT AND PATIENT RIGHTS**

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Clinical trials are essential to the advancement of medicine, but they also bring up difficult moral issues that go beyond legal requirements to include issues of human values, dignity, and trust. This essay looks at the moral dilemmas in clinical trials from a humanities standpoint, paying special attention to informed consent and patient rights. Even if international principles like beneficence, fairness, and respect for humans serve as the foundation for current research ethics, their actual application frequently clashes with social inequity, cultural norms, therapeutic misunderstandings, and power disparities between participants and researchers. The paper makes the case that informed consent should be viewed as an ongoing communication process rather than a one-time signature by drawing on philosophy, sociology, and bioethics. The significance of empathy, cultural sensitivity, and narrative comprehension in researcher-participant relationships is emphasized from a humanities standpoint. Examples of unethical testing throughout history show how a disrespect for human dignity erodes public confidence and increases vulnerability among disadvantaged groups. As a result, ethical therapeutic practice necessitates respect for participants as individuals with agency, emotions, and social circumstances in addition to following rules. The study comes to the conclusion that open discussion, community involvement, and participant-centered communication are essential to improving ethical standards in clinical trials. By enhancing understanding, defending patient rights, and promoting trust between science and society, humanities-based approaches can finally guarantee that medical advancement does not jeopardize human dignity.

Keywords: *Clinical trials, research ethics, informed consent, patient rights, bioethics, therapeutic misconception, vulnerability.*

**AI-DRIVEN CROSS-PLATFORM RECOMMENDATION THROUGH USER
BEHAVIOR AND TREND ANALYSIS**

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AI-driven recommendation systems have become a foundational component of modern digital platforms, enabling personalized content delivery, improved user engagement, and increased revenue generation. Platforms operating across diverse domains such as entertainment streaming and e-commerce increasingly rely on intelligent systems capable of understanding user behavior, contextual preferences, and emerging trends. However, traditional recommendation approaches often operate in isolation, focusing on single-platform data and static preference modeling, which limits their adaptability in dynamic user environments.



ABSTRACT

**ASSESSMENT OF PHYSICO-CHEMICAL CHARACTERISTICS AND WATER
QUALITY INDEX OF WATER RESOURCES IN BILASPUR DISTRICT,
CHHATTISGARH**

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Water is a vital natural resource that significantly influences the Earth's surface processes, ecological stability, and climate regulation. The quality of water is crucial for sustaining human health, agriculture, and aquatic ecosystems, and it is commonly assessed through its physical and chemical characteristics. The present investigation evaluates the physico-chemical properties of water in Bilaspur district, Chhattisgarh, India, to determine its suitability for domestic consumption, irrigation, and environmental sustainability. Water samples were collected from selected sites during different seasons to examine temporal fluctuations in quality. The analyzed parameters included pH, electrical conductivity (EC), total dissolved solids (TDS), dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), total alkalinity, total hardness, calcium, magnesium, chloride, nitrate, sulfate, fluoride, and iron. The analytical results were compared with the permissible standards prescribed by the Bureau of Indian Standards (BIS) and the World Health Organization (WHO). The results reveal that most of the measured parameters fall within acceptable limits; however, elevated concentrations of nitrate and iron were recorded at certain locations. Seasonal variations, especially during the monsoon season, had a noticeable impact on the Water Quality Index (WQI) values. According to WQI classification, the majority of water sources in the study area are suitable for irrigation and can be used for drinking purposes after basic treatment. The study emphasizes the need for regular monitoring, proper water resource management, and preventive strategies to minimize contamination from agricultural runoff and other human-induced activities in the region.

Keywords: *Physico-Chemical Parameters, Water Quality, Drinking Water Assessment, Nitrate and Iron Contamination.*

**MACHINE LEARNING–BASED PREDICTIVE MAINTENANCE OF
TRANSFORMERS**

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The transformers are dangerous and cheap possessions in electrical power systems. Unexpected transformer failures can lead to severe economic power losses, power outages and safety hazards. Traditional maintenance strategy such as time-based and remedial maintenance are often ineffective and costly. In modern years, Machine Learning (ML) techniques have emerge as powerful tools for predictive maintenance, enabling early electrical fault detection and condition monitor of transformers. This paper presents a complete study of machine learning [ML]–based projecting maintenance method for power transformers. The transformer health indicator such as dissolve gas analysis (DGA), oil quality parameters, load history, and thermal data are used for fault prediction. The different ML algorithms including Artificial Neural Networks (ANN), Support Vector Machines (SVM), Random Forest (RF), and Deep Learning models are analyzed. The future approach improves transformer consistency, reduces maintenance expenses, and enhances power system stability.

Keywords: *Predictive Maintenance, Machine Learning, Condition Monitoring, Fault Diagnosis, DGA, Smart Grid.*



ABSTRACT

**CATTLE INTRUSION DETECTION FOR ENHANCED ROAD SAFETY AND
SURVEILLANCE BY USING DEEP LEARNING**

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Human and wildlife conflicts are become major concern in forest and agricultural regions, this is really a major issue because of wild animals are interacted human-inhabited areas which leads to crop damage, road accidents, and threats to safety of humans. As the Chhattisgarh is a state of rich in agriculture and forest resources, frequently faces such type of challenges. Therefore, monitoring system which is an automated and intelligent, is essential to reduce problems and improve safety. This paper can help to detect and classify real-time animal detection by using deep learning techniques. The DL system utilizes transfer learning with efficient Net-architecture to identify and classify images of the animal. Image accommodation and preprocessing techniques are applied to ameliorate generalization and model performance. The trained model can identify automatically to animal species and assist in counting and monitoring them without intervention manually. The proposed solution can be implemented in Smart City surveillance systems, farm monitoring applications, forest boundary security, and road safety management effectively. For providing automated identification and accurate classification, the system will help farmers, forest departments, and urban authorities. To take timely preventive measures this approach can support to manage and maintain the ecosystem, to reduce human and wildlife conflict, and promote balance environment through intelligent surveillance technology.

Keywords: *Animal Detection, Deep Learning, Transfer Learning, Smart Surveillance, Farm Monitoring*

COLLECTION DEVELOPMENT AND MANAGEMENT

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Additionally, the processes of collection management and development are changing. This is because of the impact of the numerous and varied e-resources and tools that are widely and conveniently accessible online and can be utilized in the construction of collections. The aforementioned definition may have made it clear to you that, despite their seeming similarity, collection development and collection management are two different concepts. Thus, document collecting and selection constitute collection development. Collection management, which is primarily focused on how the collection is presented to the user, also addressed conservation and disposal issues. To put it another way, collection management is the daily execution of collection development policies that encompass those facets of library operations and services that deal with identifying the collections that are accessible to library patrons.

Keyword: *Collection Development, Digital Library, Information Manager*



ABSTRACT

EVA: A SCALABLE LOW-COST SENSOR-BASED SMART IRRIGATION ARCHITECTURE FOR RURAL INDIA

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Agriculture remains a fundamental pillar of the Indian economy; however, small and marginal farmers continue to face substantial challenges arising from inefficient irrigation practices, limited real-time monitoring, and the high costs of advanced agricultural technologies. This research proposes EVA, a scalable and cost-effective sensor-based smart irrigation architecture specifically engineered for deployment in rural agricultural landscapes. The proposed framework integrates soil moisture sensing, ambient temperature monitoring, and environmental CO₂ detection within a unified microcontroller-driven decision-making unit to enable precise automated irrigation control. Diverging from conventional monitoring-only systems, EVA introduces a modular zone-based architecture that ensures structured scalability across diverse field dimensions. The study presents a conceptual scalability model in which the coverage area increases proportionally with the number of deployed sensor nodes, enabling flexible expansion from subsistence plots to commercial-scale fields. A comprehensive cost-efficiency analysis demonstrates that the EVA architecture significantly reduces implementation overheads compared to existing commercial IoT-based solutions. Preliminary experimental evaluations indicate that the system achieves a 30–40% reduction in water consumption while minimizing manual intervention through responsive automation logic. Ultimately, the EVA framework bridges the technological gap by harmonizing affordability with engineering sophistication, promoting sustainable water resource management and improved agricultural productivity in developing economies.

Keywords: *Smart Agriculture, Plant Health Monitoring, Low-Cost Technology, Automated Irrigation, Sustainable Farming, Rural Innovation.*

RECENT ADVANCES IN HERBAL IMMUNOMODULATORS: MECHANISMS AND CLINICAL IMPLICATIONS

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Herbal immune modulators have garnered significant scientific interest due to their potential to modulate immune responses with reduced side effects compared to conventional synthetic agents. Recent advances in phytochemistry, molecular biology, and clinical research have deepened our understanding of the immune modulatory properties of diverse botanical compounds, including polysaccharides, flavonoids, terpenoids, alkaloids, and glycoproteins. Mechanistic studies reveal that these natural compounds can regulate both innate and adaptive immunity by influencing cytokine production, enhancing macrophage and natural killer (NK) cell activity, modulating T and B lymphocyte proliferation and differentiation, and regulating signaling pathways such as NF- κ B, MAPK, and JAK-STAT. Emerging evidence also highlights the role of herbal bioactives in antioxidant defense, gut microbiota modulation, and chronic inflammation resolution, thereby offering multifaceted effects on immune homeostasis. Clinical trials and observational studies have demonstrated promising outcomes in conditions such as recurrent infections, autoimmune disorders, cancer therapy supportive care, and vaccine adjuvancy, although heterogeneity in study design and quality persists. Standardization of herbal extracts, identification of active constituents, and elucidation of pharmacokinetics remain critical challenges to translational application. Moreover, safety profiles and herb-drug interactions necessitate rigorous evaluation. Overall, contemporary research underscores the therapeutic potential of herbal immune modulators as complementary agents in immune-related diseases. Future directions include systems biology approaches, high-throughput screening, and well-powered randomized controlled trials to substantiate efficacy, optimize formulations, and integrate phytomedicines into evidence-based clinical practice.

Keywords: *Immuno modulators, Autoimmune disorders, NF- κ B, MAPK, and JAK-STAT,*



ABSTRACT

**SEISMIC ANALYSIS AND PERFORMANCE EVALUATION OF BRIDGES IN
EARTHQUAKE**

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Bridges are vital lifeline structures that play a significant role in transportation networks and post-disaster emergency response. In seismic-prone regions, bridges are highly vulnerable to earthquake-induced ground motions, which can generate substantial inertial forces and cause severe structural damage. This research paper presents a comprehensive study on the seismic analysis and performance evaluation of bridge structures subjected to earthquake loading. The study focuses on understanding the dynamic behavior of bridges through analytical approaches such as Response Spectrum Analysis and Time History Analysis, based on codal provisions. Key Parameters influencing seismic performance, including stiffness, mass distribution, ductility, structural configuration, and soil-structure interaction, are examined in detail. The research also investigates common damage mechanisms such as excessive deck displacement, bearing failure, column cracking, foundation instability, and pounding effects between adjacent spans.

**ACUTE BEHAVIOURAL AND MORPHOLOGICAL ALTERATIONS INDUCED BY
DELTAMETHRIN EXPOSURE IN LABEO ROHITA**

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Synthetic pyrethroids used in agriculture frequently enter freshwater systems through runoff and pose toxic risks to non-target aquatic organisms. The present study evaluated the acute behavioural and morphological toxicity of deltamethrin in *Labeo rohita* fingerlings, an economically important carp widely cultured in India. Healthy fingerlings were acclimatized and exposed to sub-lethal concentrations of deltamethrin alongside an untreated control. Fish were maintained under controlled laboratory conditions, and behavioural and external morphological responses were recorded at 24, 48, 72, and 96 hours. Exposed fish exhibited pronounced stress responses compared with control, including erratic and sluggish swimming, restlessness followed by lethargy, surface gasping, altered position preference and disrupted schooling behaviour. Opercular movement increased during early exposure, indicating respiratory distress, but declined with prolonged exposure, suggesting physiological exhaustion. Morphological abnormalities included excessive mucus secretion, skin erosion, fin deterioration, scale detachment, pale and swollen gills, cloudy and bulging eyes, darkened body coloration, and curvature of the body. The severity of responses was concentration-dependent and intensified with exposure duration. The findings demonstrate that even sub-lethal concentrations of deltamethrin induce significant behavioural and morphological disturbances in *Labeo rohita*, reflecting respiratory impairment, epithelial damage, and neuromuscular dysfunction. Behavioural and external biomarkers proved to be sensitive indicators of pesticide stress and can serve as practical tools for early detection of aquatic contamination. This study highlights the ecological risks of pyrethroid runoff and underscores the need for monitoring and regulation to protect freshwater biodiversity and aquaculture sustainability.

Keywords: *Deltamethrin, Labeo rohita, Behavioural biomarkers, Freshwater pollution, Pyrethroid*



ABSTRACT

**ASSESSMENT OF BEHAVIOURAL ALTERATIONS IN LABEO
ROHITA EXPOSED TO HOUSEHOLD DETERGENT**

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Household detergents are increasingly recognized as emerging aquatic pollutants because they contain surfactants, bleaching agents, enzymes and fragrances that can persist in aquatic environments and alter water chemistry. These compounds reduce surface tension, disrupt membrane integrity and interfere with respiration in aquatic organisms. Continuous discharge of domestic wastewater into freshwater bodies allows these contaminants to accumulate, enter trophic pathways and potentially reach humans through bio-magnification. Despite their widespread use, information on sub-lethal behavioural toxicity of detergents in food fishes remains limited. The present study was undertaken to evaluate the toxic effects of detergent exposure in *Labeo rohita*, an economically important freshwater carp, with particular emphasis on behavioural responses as early indicators of stress. Fish were exposed to sub-lethal concentrations of a commonly used household detergent under controlled laboratory conditions and systematic behavioural observations were recorded. Exposed fish exhibited marked alterations in swimming pattern, increased opercular movement, frequent surface gulping, loss of equilibrium and prolonged bottom resting compared with the control group. The severity and frequency of these responses increased proportionally with detergent concentration, indicating progressive physiological distress and impaired respiratory and neuromuscular function. The findings suggest that detergent contamination induces acute behavioural toxicity in *Labeo rohita*. The behavioural endpoints are often considered sensitive to the environmental stress and serve as the practical biomarkers for assessing the freshwater pollution.

Keywords: *Labeo rohita*, Behavioural Responses, Detergent, Pollution, Aquaculture, Toxicity

**SOLID LIPID NANOPARTICLES (SLNS) FOR CONTROLLED DRUG DELIVERY:
FORMULATION STRATEGIES, CHARACTERIZATION, ROUTE-SPECIFIC
APPLICATIONS, AND FUTURE PERSPECTIVES**

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Solid Lipid Nanoparticles (SLNs) have emerged as a promising colloidal carrier system for controlled drug delivery due to their biocompatibility, biodegradability, scalability, and ability to modulate drug release profiles. SLNs are submicron particles composed of solid lipids stabilized by surfactants, designed to encapsulate both hydrophilic and lipophilic drugs. This review provides a comprehensive overview of SLN formulation principles, preparation methods, physicochemical characterization techniques, drug release mechanisms, and route-specific applications including oral, transdermal, and parenteral delivery. The article discusses advantages, limitations such as polymorphic transitions and drug expulsion, and recent advancements including surface functionalization and nanostructured lipid carriers (NLCs). Emphasis is placed on controlled release behavior, enhancement of bioavailability, and clinical translation challenges. The review concludes with future perspectives on targeted delivery, personalized medicine, and regulatory considerations for large-scale pharmaceutical production.

Keywords: *Solid Lipid Nanoparticles, Controlled Drug Delivery, Oral Delivery, Transdermal Delivery, Parenteral Delivery, Nanostructured Lipid Carriers, Drug Release Kinetics*



RENEWABLE ENERGY INTEGRATION IN SMART GRID

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The increasing need for electricity and the environmental impact of conventional power generation have accelerated the shift toward renewable energy sources. However, the discontinuous and scattered nature of solar power and wind energy create serious challenges to centralized power network in terms of stability, availability, and power quality. This study addresses the complication of efficiently integrating green energy into smart grid systems while ensuring reliable operation. The objective of this investigation is to develop a smart grid-based framework that allows effective monitoring, control, and management of distributed energy resources. The recommended strategy makes use of advanced metering infrastructure, real-time data transmission, and intelligent control strategies to balance supply and demand in real time. Demand response techniques and load forecasting methods are implemented to enhance grid flexibility and reduce variability impacts. The results indicate improved voltage regulation, reduced transmission losses, and enhanced renewable integration compared to existing infrastructure. Overall, the study shows that smart grid technologies provide a sustainable and step by step process for huge renewable energy integration.

Keywords: *Renewable energy integration, Smart grid, Distributed generation, Advanced metering infrastructure (AMI), Demand response.*

POWER QUALITY IMPROVEMENT USING SHUNT ACTIVE POWER FILTER

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This paper presents the design, modeling, and advanced control strategies for a Shunt Active Power Filter (SAPF) aimed at mitigating current harmonics and improving power factor in distribution systems with nonlinear loads. The instantaneous $p-q$ theory is used for reference current extraction and a hysteresis-based current controller is implemented. Recent control enhancements including model predictive control, neural-network-assisted controllers, and hybrid filter schemes are reviewed and compared. Simulation results demonstrate THD reduction below recommended limits.

Keywords: *Shunt Active Power Filter, Harmonic Compensation, THD, Instantaneous $p-q$ Theory, Model Predictive Control.*



ABSTRACT

EXPLAINABLE AI FOR DIGITAL FORENSIC EVIDENCE ANALYSIS

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The rapid growth of digital devices and cyber activities has led to an exponential increase in digital forensic evidence, making automated analysis essential for timely and accurate investigations. Artificial Intelligence (AI) and Machine Learning (ML) techniques have been widely adopted in digital forensics for tasks such as malware classification, network intrusion detection, image and video forensics, and log analysis. However, most highperformance AI models, especially deep learning architectures, function as black-box systems, limiting their transparency, interpretability, and legal acceptability in judicial proceedings. This lack of explainability raises concerns regarding trust, accountability, bias, and compliance with legal standards such as the Daubert and Frye criteria

Keywords: *Explainable Artificial Intelligence, Digital Fo-rensic Science; Deepfake Detection.*

**COMPREHENSIVE ANALYSIS OF LOSS MECHANISMS IN ELECTRIC VEHICLE
POWER CONVERTERS AND INVERTERS**

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Electric Vehicles (EVs) depend on high-efficiency DC–DC converters and DC–AC inverters for propulsion and auxiliary power management. Losses in this power electronic systems directly decrease vehicle range, amplify thermal stress, and affect reliability. This paper presents a detailed analytical study of major loss mechanism in EV converters and inverters, including switching losses, conduction losses, magnetic losses, gate drive losses, reverse recovery losses, and thermal losses. Mathematical models are derived to measure each loss component. A case study of a 400 V, 50 kW EV drive train is evaluate using analytical calculations and simulation-based validation. The results show that switching and conduction losses account for approximately 60–70% of total converter losses, highlighting the need for advanced semiconductor devices and optimized control strategies.

Keywords: *Electric Vehicles (EV), DC–DC Converter Losses, Inverter Losses, Switching Losses, Conduction Losses, Thermal Losses, Power Electronics.*



ABSTRACT

**A MULTI-LAYERED AI SYSTEM FOR DETECTING COORDINATED INFLUENCE
AND INAUTHENTIC BEHAVIOR IN SOCIAL MEDIA**

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We are witnessing the rise of social media and access to the internet has revolutionized the way information is shared, which provides fast communication but also facilitates the spread of misinformation and fake narratives. Misinformation can influence public opinion, increase social polarization, and contribute to social vulnerability. This research focuses on developing an AI-based system to detect and mitigate the impact of misinformation on social media platforms, with an initial focus on X (Twitter) due to its data accessibility through APIs. Many models, including traditional classifiers (logistic regression, random forest) and transformer-based architectures, were evaluated for accuracy and robustness in detecting misinformation and harmful content. The proposed system is enabled with natural language processing (NLP), machine learning, and graph-based modeling to analyze textual content, user interactions, and propagation patterns. Data collection is done through public APIs and preprocessed using tokenization, stop-word removal, and embedding techniques. The results show that the combination of contextual explanations from LLMs and user-news interaction graphs improves detection and provides better calibrated predictions. A data visualization interface was provided to facilitate real-time monitoring of suspicious content and accounts. Our work contributes to digital safety as an AI-based framework capable of reducing the impact of fake information and supporting informed public discourse.

Keywords: *Misinformation detection, social polarization, natural language processing, large language model, social media analysis, tokenization.*

**REAL-TIME ENVIRONMENTAL IMPROVISATION AND PSYCHO-ADAPTIVE
GAME AI: BEYOND SCRIPTED BEHAVIOR AND MIMICRY**

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While the visual fidelity of video games has achieved photorealism through technologies such as ray tracing and nanite geometry, the behavioral complexity of Non-Player Characters (NPCs) has remained largely stagnant for two decades. Contemporary Game AI predominantly relies on Finite State Machines (FSMs) and Behavior Trees, limiting agents to prescribed interactions that fail to account for dynamic environmental affordances or player psychology. Although recent integrations of Generative Adversarial Networks (GANs) and Large Language Models (LLMs) have enabled "Semi Generative" capabilities— such as voice cloning and dynamic dialogue —these systems function primarily as mimics, lacking genuine cognitive reasoning or tactical improvisation. This research paper proposes "Project Mirror," a novel dual engine architecture designed to bridge the gap between scripted logic and cognitive autonomy.



AI MOCK INTERVIEW

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This research paper presents the design and development of a full-stack AI-powered Mock Interview System that delivers an interactive and personalized interview experience through a live streaming AI avatar. The application begins with a modern, customizable landing interface and provides secure user authentication using Clerk, allowing login via Google or email-password. Once authenticated, users access a dashboard where they can create new mock interviews or review previously completed sessions to generate interview questions, the system offers two flexible options: users can upload their resume or manually enter a job description with a title and detailed role information. The uploaded data triggers an automated workflow built in n8n, which processes the input, generates context-specific interview questions, and returns them to the application. This workflow can be executed both locally on the cloud and Hostinger is used to host n8n for production environments. When the interview begins, users are redirected to a live interview session powered by Akool's Streaming Avatar API. The AI interviewer communicates in real time, asks the generated questions, and interacts with the candidate through voice and video, creating a realistic interview simulation. All interview sessions, questions, user details, and AI feedback are stored securely in Convex, a real-time open-source database. After the session ends, the system automatically generates personalized feedback, suggestions, and ratings based on user responses. This project demonstrates the seamless integration of modern frameworks and AI services—including Next.js, React, Convex, Clerk, Akool, ArcJet, and n8n—to build a scalable and immersive platform for interview preparation.

Keywords: *Artificial Intelligence, Next.js, React, n8n, Convex, ArcJet, Akool Streaming Avatar, Clerk Authentication, Hostinger n8n Hosting.*

NEXAI : A FULL STACK AI SAAS APPLICATION USING THE PERN STACK

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Artificial Intelligence (AI) has rapidly emerged as a transformative technology capable of driving automation, data analytics, and intelligent decision-making across various industrial and academic sectors. With the increasing demand for cloud-based solutions, the Software as a Service (SaaS) model has become the preferred architecture due to its flexibility, scalability, reduced deployment time, and subscription-based accessibility. This research presents the design and implementation of a Full Stack AI-enabled SaaS application built using the PERN stack—PostgreSQL, Express.js, React.js, and Node.js. The proposed system aims to deliver AI-powered functionalities such as real-time text generation, summarization, and conversational assistant through a web-based interface requiring no local installations. The study highlights the integration of modern AI models with a scalable backend to support real-time operations. System evaluation demonstrates improved productivity, reduced manual workload, and enhanced accessibility across devices. Findings show that integrating AI with SaaS through the PERN architecture provides a cost-efficient and highly scalable platform suitable for startups, academic learning, and enterprise-level deployment. Further recommendations include extending advanced multimodal AI features and improving distributed server scaling to support large user bases.

Keywords: *Artificial Intelligence (AI); SaaS; PERN Stack; PostgreSQL; Express.js; React.js; Node.js; Cloud Computing; Text Generation; Summarization; Conversational AI; Real-time Processing; Scalable Deployment.*



ABSTRACT

**AUTOMATION OF EXAMINATION SEATING PLAN USING FLASK AND SQLITE :
WEARRANGE**

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The "Automation of Examination Seating Plan Using Flask and SQLite (wearrange)" is an innovative web-based application designed to automate the generation of seating arrangements for exams. This system uses Flask, a lightweight Python framework, for the back-end and SQLite, a self-contained, serverless database engine, to store and manage data efficiently. The application aims to streamline the process of seating allocation by automatically assigning students to exam halls, ensuring proper distribution across available rooms. The key features of the system include user authentication, where exam administrators can securely log in, input student and room details, and define exam schedules. The system processes these inputs to generate seating charts that can be customized for multiple exam sessions. The seating plan is displayed in a clear, organized manner, ensuring optimal room utilization and preventing overcrowding. Additionally, the generated seating arrangements can be downloaded as a PDF for printing and distribution.

Keywords: *Automation, Examination Seating Plan, Flask, SQLite, Web Application, Seat Allocation, Room Management, User Authentication, PDF Generation, Database Management, Exam Scheduling, Educational Institutions, Web Interface, Administrative Efficiency.*

BT-BASED METAL DETECTOR ROBOT WITH VOICE RESPONSE

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Metal detection and autonomous robotics have become essential technologies in security, industrial inspection, and disaster management. This research presents the design and implementation of a Bluetooth-based (BT) Metal Detector Robot integrated with a Voice Response Module, capable of remotely navigating and detecting metallic objects. The system incorporates a metal detection coil, microcontroller unit, motor driver, Bluetooth module, and a voice response circuit to verbally notify detection events in real time. The robot is controlled wirelessly via a mobile application, enabling long-range, energy-efficient communication and enhanced operability. Experimental evaluations demonstrate that the system achieves reliable detection of ferrous and nonferrous metals with stable voice output and smooth locomotion. The proposed design is low-cost, scalable, and suitable for security inspection, landmine detection training, industrial monitoring, and smart automation applications.

Keywords: *Metal Detector Robot, Bluetooth Control, Voice Response Module, Embedded System, Wireless Robotics*



EMAIL SPAM DETECTION USING MACHINE LEARNING

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The pervasive use of email has been paralleled by a rise in spam, leading to security threats like phishing, malware distribution, and information overload. This project presents an intelligent system for the automatic classification of emails as spam or ham (non-spam) using machine learning (ML) and natural language processing (NLP) techniques. We implement and compare several classification algorithms, including Naïve Bayes, Support Vector Machine (SVM), Logistic Regression, and Random Forest. The model pipeline involves comprehensive text preprocessing (tokenization, stopword removal, stemming) and feature extraction using TF-IDF. Evaluated on a public dataset, the system demonstrates high efficacy, with the SVM model achieving the highest accuracy of 98.1%. This work underscores the potential of Python-based ML libraries in developing efficient, scalable, and cost-effective solutions for email security, providing a foundational framework for future integration into real-world email systems. Keywords: Email Spam Detection, Machine Learning, Natural Language Processing (NLP), TF-IDF, Support Vector Machine (SVM), Naïve Bayes, Python, Scikit-learn.

Keywords: *Email Spam Detection, Machine Learning (ML), Natural Language Processing (NLP), Text Classification, Feature Extraction, TF-IDF, Support Vector Machine (SVM), Naïve Bayes, Logistic Regression, Random Forest, Python, Scikit-learn, Cyber security.*

EVERAURA: A REAL-LIFE WEB-BASED JEWELLERY STORE USING LOCALSTORAGE AND WHATSAPP ORDER PROCESSING

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This research paper presents the design and development of Everaura, a fully functional, webbased jewellery e-commerce platform built using HTML, CSS, and JavaScript. Unlike modern frameworks that depend on large tech stacks, Everaura demonstrates the feasibility of creating a real-life commercial shopping experience using lightweight technologies and traditional JavaScript methods. The system enables customers to browse jewellery collections, add items to the cart using browser-side Local Storage, and place orders directly through WhatsApp-based cart transmission, making it suitable for small businesses operating with limited infrastructure. The admin receives complete cart details on WhatsApp and dispatches orders through local postal services. The implementation proves that a scalable, user-friendly, and low-cost e-commerce solution can be built without backend servers or databases, leveraging only client-side operations and widely available messaging apps. This paper outlines the system's architecture, workflow, testing results, and future enhancements suitable for MSME-level digital commerce.

Keywords: *E-commerce, JavaScript, LocalStorage, WhatsApp Ordering, Web Development, Lightweight Architecture, Jewellery Store.*



ABSTRACT

FAKE NEWS DETECTION USING MACHINE LEARNING

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The rapid expansion of digital media and online news platforms has significantly increased the spread of misinformation, posing a serious threat to social stability, political integrity, and public trust. Fake news can influence opinions, create panic, manipulate markets, and distort democratic processes. To address this growing challenge, this research presents a *machine-learning-based fake news detection system* integrated into an interactive web platform titled **E-News Paper**. The system utilizes Natural Language Processing (NLP) techniques to analyze textual news content and classify it as either real or fake. A dedicated web interface built using **Flask** allows users to browse curated news articles and verify the authenticity of any text input through the integrated ML model. The system incorporates scalability for future enhancements, including **real-time API-based news fetching**, continuous model updates, and deep-learning-based fake news analysis. Experimental evaluation using benchmark datasets such as the LIAR dataset shows the model's ability to handle large volumes of textual data and achieve reliable classification performance. Overall, this project provides an efficient, accessible, and user-friendly solution to combat misinformation, contributing to safer digital communication and informed decision-making.

**DESIGN AND DEVELOPMENT OF A JAVA-BASED, TECHNOLOGY-ENHANCED
MOBILE FITNESS MANAGEMENT SYSTEM FOR HEALTH MONITORING**

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The swift progress of mobile technology has revolutionized the health and fitness industry by enabling personalized fitness support to be available to users via their smartphones. The Fitness Management App, created using Java in Android Studio, seeks to offer users a holistic platform for overseeing their fitness activities, tracking their progress, and fostering healthier lifestyles. The application gathers crucial personal information, such as age, weight, height, gender, health issues, and particular fitness objectives like weight loss, weight gain, or muscle building. Utilizing this data, it produces tailored workout plans and nutritional suggestions that cater to the user's needs. The app features exercise scheduling, interval timers, calorie burn calculations, daily logging systems, and weekly summary charts that visually represent user performance. Furthermore, motivational alerts assist users in remaining consistent throughout their fitness journey. With its streamlined design, user-friendly navigation, and effective data processing, the system serves as a dependable wellness aide. This project showcases the capability of Java and Android Studio to develop a scalable, engaging, and user-focused fitness management tool that caters to a wide range of users.



INFO AI CHAT-BOT

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The rapid growth of digital communication has increased the need for instant access to accurate information. Educational institutions, in particular, require efficient systems to handle repetitive queries from students, parents, and visitors. This research paper presents the INFO AI Chatbot, a hybrid conversational system designed using Flask, rule-based responses, and AI-generated answers through the Open Router API. The chatbot provides instant replies to common college-related queries while intelligently handling complex or previously unknown questions using a large language model. The system enhances user experience, reduces workload on administrative staff, and delivers reliable, automated responses. The results demonstrate that the hybrid architecture ensures both accuracy and flexibility, making the chatbot a valuable tool for educational institutions.

A LIGHTWEIGHT IOT DECEPTION FRAMEWORK: ESP8266-BASED EVIL TWIN HONEYPOT FOR REAL-TIME DEVICE FINGERPRINTING AND ATTACK ANALYTICS

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Wireless networks have emerged as a primary target for attackers due to the widespread adoption of public Wi-Fi, IoT devices, and unsecured access points. Among these threats, Evil Twin access points remain one of the most effective techniques for deceiving users and harvesting sensitive information. This research presents a lightweight IoT-based deception framework that utilizes the ESP8266 microcontroller to create an Evil Twin Wi-Fi honeypot capable of real-time device fingerprinting and attack analytics. The proposed system emulates an open Wi-Fi access point, deploys a captive portal for interaction logging, and captures critical metadata such as MAC addresses, assigned IP addresses, user-agent strings, and credential attempts. To enhance intelligence, the system integrates Geo-IP and OS fingerprinting techniques for attacker profiling. Collected data is forwarded to a centralized Flask server for storage, visualization, and analysis. The prototype demonstrates a low-cost, scalable, and effective approach to studying attacker behavior on wireless networks. Experimental results validate the system's ability to capture multi-device interactions, infer device characteristics, and generate actionable security insights suitable for academic, forensic, and cyber security research settings.



ABSTRACT

**SAY IT! WITH A STRAIGHT FACE: REAL-TIME EMOTION DETECTION AND
SPEECH RECOGNITION FOR AN INTERACTIVE WEB-BASED “POKER FACE”
CHALLENGE**

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This paper presents the design, implementation, and evaluation of “Say It! With a Straight Face”, a fullstack web-based game that challenges players to read deliberately absurd phrases aloud while maintaining complete facial neutrality. The application combines real-time facial emotion recognition (Face++ API), client-side face landmark detection (TensorFlow.js BlazeFace), speech verification via the Web Speech API with fuzzy matching, and low-latency bidirectional communication through Socket.IO. Built using Vite, Express.js, and Node.js, the game features a three-phase responsive interface, live emotion monitoring with a 66% intensity threshold, a 1.2- second grace period, and an instant shareable gameover screen. Testing with 30 participants revealed an average score of 8.4 phrases, with happiness being the dominant failure emotion (72%). The system demonstrates the feasibility and entertainment potential of browser-based AI for real-time multimodal interaction without requiring native applications. The project is publicly deployed at <https://straightface.onrender.com> and serves as a practical case study of integrating computer vision, speech processing, and real-time web technologies.

Keywords: *Facial emotion recognition, real-time web applications, Web Speech API, TensorFlow.js, Socket.IO, gamification, interactive AI, full-stack JavaScript*

SKILL SWAP (A PEER-TO-PEER SKILL EXCHANGE PLATFORM)

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In today’s digital era, acquiring new skills and sharing knowledge has become essential for personal, academic, and professional growth. However, traditional learning systems often lack personalization, accessibility, and interactive engagement. The SkillSwap platform aims to address these limitations by providing an AI-assisted, community-driven skill exchange system where users can teach and learn skills from one another. The system enables users to register, create detailed skill profiles, manage learning goals, request skill swaps, and engage in real-time communication. By integrating structured matching logic, review mechanisms, and analytics modules, SkillSwap offers a seamless and transparent environment for knowledge sharing. The core objective of the platform is to intelligently connect users based on the skills they offer and the skills they wish to acquire. Using a dynamic matching algorithm, robust user profiling, and modular backend architecture, SkillSwap enhances discoverability and ensures meaningful interactions between users.

Keywords: *Skill swap, peer learning, skill exchange, user matching, MERN stack, real-time chat, review system, dashboard analytics, skill discovery, community learning.*



ABSTRACT

DEEPPFAKE IMAGE DETECTION USING AI WITH SELF-SUPERVISED LEARNING

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This project aims to build an AI system that can detect deepfakes—images that are edited or computer-generated to look real. The system uses both labeled and unlabeled data so it can learn important features even without manual tags. The workflow includes collecting data, cleaning it, building the model, training, testing, and finally deploying it. The model will use deep learning methods such as CNNs and Vision Transformers to find small changes that appear in fake images, like face swaps or blended synthetic content. Its performance will be measured using accuracy, precision, recall, F1-score, and AUC.

Keywords: *Deepfake detection, image manipulation, CNN, Vision Transformer, self-supervised learning, digital forensics.*

**ATTENDVISION: AI-POWERED VIRTUAL ASSISTANT FOR INTELLIGENT
AND SECURE VOICE-CONTROLLED AUTOMATION**

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Traditional voice-based assistant systems are highly susceptible to spoofing and replay attacks, and many deployed solutions do not have any reliable method to distinguish a real human speaker from an artificial or recorded voice sample (e.g., cloned AI voice or replayed audio). This paper describes the design and implementation of a secure, scalable and intelligent desktop AI voice assistant that directly addresses these vulnerabilities. The main contribution is a hybrid, multi-stage verification pipeline, which uses a lightweight **AudioFASNet** model to perform **voice liveness detection** along with a state-of-the-art **X-Vector deep network** to perform **speaker identity recognition**, and is triggered by a fast wake-word detector to activate the assistant in real time. The system stores **512-dimensional speaker embeddings** in PostgreSQL using the **pgvector extension** with an **IVFFLAT index** to run an approximate nearest-neighbor search with sub-linear $O(\sqrt{N})$ performance, solving the poor scalability issues associated with naive linear $O(N)$ searches across large audio-based feature vectors. Moreover, the system integrates an intelligent notification engine that informs users about important system events, security alerts, scheduled tasks, and attempted unauthorized voice access, bridging recognition, analytics, and user-side intervention. The functional prototype is experimentally validated to exhibit strong anti-spoofing performance, where genuine users consistently achieve liveness scores between **0.56 and 1.00** under normal room conditions, while replay and AI-generated voice attacks are reliably rejected. The recognition pipeline demonstrates over **90% accuracy** at a similarity-calibrated threshold of **0.5**. Overall, the proposed work presents a full-fledged, deployment-ready architecture that eliminates spoof-based misuse, enables secure voice interaction, and provides a scalable, intelligent, hands-free assistant suitable for desktops in homes, offices, and academic environments.

Keywords: *Voice Recognition, Anti-Spoofing, Voice Liveness Detection, Deep Learning, X-Vector, Speaker Authentication, Audio Processing, Vector Database, Intelligent Assistant, Security Alerts*



ABSTRACT

CAMPUSBOT: AI HELPDESK ASSISTANT

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In higher education environments, students frequently encounter difficulties in accessing essential academic information such as examination schedules, notices, syllabus changes, and timetable updates. Traditional communication channels including static websites, PDF notices, and manual announcement sare often slow, non-interactive, and require repeated clarification from faculty. To overcome these limitations, CampusBot, an AI-driven helpdesk system, has been developed to facilitate seamless interaction between students and the college administration. The system employs a conversational interface powered by the model for intelligent query handling, supported by a modern technology stack comprising React.js for the frontend, Node.js with Express for backend services, and MongoDB Atlas for cloud-based data management. CampusBot enables real-time information retrieval, automated response generation, and centralized content management through dedicated admin and faculty panels. The methodology incorporates requirement analysis, system design, component-wise development, and iterative testing to ensure reliability and accuracy. By integrating artificial intelligence with institutional data systems, CampusBot addresses administrative redundancy, enhances student engagement, and contributes to a more efficient and digitized academic ecosystem.

CAMPUSSUTRA: A HIGH-PERFORMANCE CENTRALIZED DIGITAL PLATFORM FOR CAMPUS EVENT MANAGEMENT AND ARCHIVAL USING NEXT.JS

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Cultural, technical, and academic events play a vital role in the holistic development of students within higher educational institutions. However, most colleges still rely on fragmented and inefficient methods for event documentation and management, resulting in data loss, reporting challenges, and limited accessibility. This paper presents **CampusSutra**, a centralized digital platform designed for LCIT College to streamline event documentation, archival, and dissemination. Built using the modern Next.js framework, the system ensures high performance, scalability, and responsive user experience through hybrid rendering techniques such as Server-Side Rendering (SSR) and Static Site Generation (SSG). CampusSutra provides a unified repository for event media, reports, and schedules, serving as a single source of truth for stakeholders. The system architecture, methodology, implementation strategy, and future enhancements toward a complete Event Management System (EMS) are discussed in detail.

Keywords: *Event Management System, Next.js, Centralized Archive, Web Performance, Campus Documentation, SSR, SSG.*



ABSTRACT

**BUILDING SMARTER LEXICONS: DEVELOPING A DICTIONARY CHATBOT
FOR SEAMLESS LANGUAGE UNDERSTANDING**

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This project details the creation of a Smart Dictionary Chatbot, a web-based application designed to help users enhance their English vocabulary through interactive and intelligent features. Built using the Flask framework in Python, the chatbot utilizes the Free Dictionary API to deliver real-time information such as word definitions, examples, synonyms, antonyms, and phonetic pronunciations. It also includes a text-to-speech feature for pronunciation, ensuring accessibility for all users. A notable innovation in this system is the inclusion of data-driven visualizations, such as an interactive word-relation network graph that illustrates connections between related words, and a usage-trend chart that shows how often words are searched over time. These visual tools improve user engagement and turn vocabulary learning into a more analytical process. The chatbot features a dark-themed, responsive interface for a clean and immersive experience, along with a search history and a “word-of-the-day” function to encourage daily learning. This project highlights how integrating Flask, API services, and AI-based speech synthesis can create an effective and engaging educational platform for personalized vocabulary development.

DRIVER DROWSINESS DETECTION SYSTEM

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The intelligent and sophisticated Driver Drowsiness Detection System was created to reduce traffic accidents brought on by drivers' inattention or fatigue. Using a real-time camera, the system continuously tracks the driver's facial movements and evaluates the duration and frequency of eye closure. It can identify when the driver's eyes stay closed past a predetermined threshold by using image processing to calculate the Eye Aspect Ratio (EAR). The device immediately sounds an alarm to warn the driver and avert a potential collision when it detects tiredness. This technique offers a quick, effective, and non-intrusive solution to guarantee road safety and lower driving-related human error. For precise facial landmark detection and efficient image processing, the suggested model makes use of Python modules like OpenCV, dlib, and NumPy. It is an affordable, dependable option that is simple to install in automobiles. This device contributes significantly to safer roads and the saving of many lives by preventing sleepy driving and issuing appropriate warnings. All things considered, the Driver Drowsiness Detection System makes a substantial contribution to the advancement of road safety and contemporary intelligent car technology.

Keywords: *Driver Drowsiness Detection, Eye Aspect Ratio (EAR), Mouth Aspect Ratio (MAR), OpenCV, dlib, Python, Computer Vision, Image Processing, Fatigue Detection, Alert System.*



EVENT MANAGEMENT SYSTEM

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Institutions of higher learning need to have a digital system to manage events efficiently and effectively. College Event Management Systems (CEMS) is a user-friendly digital program that automates and facilitates the organization, registration and participation functions of all minutes and acts of a college's events. CEMS integrates the efforts of the students, event organizers, and administrators, enabling them to manage coordination and control of all theatre, class, and leadership events of the academic calendar year. The objectives of CEMS is to systematize event activities all the old and traditional ways of handling events that were done manually in a labor intensive, slow, and hand error written process. CEMS will allow colleges to organize, control and manage all event and activities in an accessible system. Students have the ability to access the calendar of forthcoming activities in addition to registering for them in advance and receiving notifications regarding activities and changes to the schedule.

EXPLAINABLE TEXT CREATION: COMBINING NEURONPEDIA WITH GPT-2 FOR CLEAR AI RECOMMENDATIONS

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The growing popularity of large language models (LLMs) such as GPT-2 in creative and professional tasks has become a source of a significant issue: the lack of transparency in their decision-making process, also known as the black-box problem. This transparency essentially restrains user confidence and responsibility, especially in instances where AI recommendations are integrated into text written by humans. This paper is going to introduce the creation of the Smart Scribe, an AI-based writing application that would directly solve this problem. We combine a refined GPT-2 model of real-time text generation and auto-completion with a highly advanced model interpretability platform, Neuronpedia API. The app is dynamically visualized and displays the top Sparse Autoencoder (SAE) features the most activated by the input text, which is a human-readable explanation of why the AI is later suggesting specific tokens. The resultant system is a proof-of-concept that shows an important step on developing reliable AI systems where the motivation behind the suggestion is visible as the suggestion itself.

Keywords: *Large Language Models (LLMs), GPT-2, AI Explainability (XAI), Sparse Autoencoders (SAEs), Model Interpretability, Writing Assistant, Neuronpedia API, Transparency*



PDF SUMMARIZER USING PYTHON

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This research report presents the design, development, and implementation of a PDF Summarizer using Python, integrating pdfplumber for text extraction, Hugging Face Transformer models for natural language summarization, and PyQt6 for building a desktop GUI. The system addresses challenges associated with manual document review such as time consumption, inefficiency, and information overload. The proposed automated summarizer enhances productivity by generating concise and meaningful summaries from lengthy PDF documents.

ATTENDVISION: MACHINE LEARNING-BASED FACE RECOGNITION WITH LIVENESS DETECTION FOR ATTENDANCE AUTOMATION

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Traditional attendance systems are quite susceptible to proxy attendance and presentation attacks, and the vast majority of the deployed solutions do not have any credible means of identifying a living subject and a spoof (e.g., printed photo or replayed video). This paper describes a design and implementation of a secure, scalable and intelligent attendance management system that directly addresses these vulnerabilities. The main contribution is a hybrid, multi-stage verification pipeline, which involves a lightweight MiniFASNet model to perform liveness detection with a state-of-the-art ArcFace deep network to perform identity recognition, and is initiated by a fast Haar Cascade detector to localize faces in real-time. The system stores 512-dimensional faceprint in PostgreSQL with pgvector extension and an IVFFLAT index to run an approximate nearest neighbor search with sub-linear $O(\sqrt{N})$ performance to counteract the poor scalability of naive linear $O(N)$ search over facial embeddings. Moreover, the system incorporates an email alerts system that informs the students and administrators when the attendance drops below a set student attendance limit bridging recognition, analytics, and intervention. The functional prototype is experimentally validated to have strong anti-spoofing performance, and genuine users can always yield liveness between 0.56 and 1.00 with good lighting conditions, and print attacks are rejected. The recognition pipeline is found to be over 90% accurate at a similarity calibrated threshold of 0.5. On the whole, the given work offers a full-fledged, deployment-ready architecture that excludes the fraud based on the proxies, enabling email notification, and a viable, scalable, contactless attendance system in schools and colleges.

Keywords: Face Recognition, Anti-Spoofing, Liveness Detection, Deep Learning, ArcFace, Attendance System, Biometric Authentication, Computer Vision, Vector Database, Email Alerts



ABSTRACT

QUICK GPT: AN INTELLIGENT CONVERSATIONAL AI SYSTEM WITH INTEGRATED IMAGE GENERATION CAPABILITIES

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Quick GPT is an advanced conversational AI system designed to provide rapid responses to user queries while incorporating multi-modal capabilities through image generation. Built using modern web technologies including React.js for the frontend, Node.js for the backend, and powered by Google Gemini API, the system demonstrates efficient query processing and response generation. The application integrates ImageKit for dynamic image generation, MongoDB for data persistence, and is deployed on Vercel for optimal performance and scalability. This research paper presents the development, architecture, implementation, and future scope of Quick GPT, highlighting its potential to revolutionize human-computer interaction through intelligent conversational interfaces.

Keywords: *Conversational AI, Google Gemini, Image Generation, React.js, Node.js, Natural Language Processing, ImageKit, Stripe, MongoDB, Real-time Response System.*

FAKE NEWS DETECTION USING NEURAL NETWORK

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The rapid spread of online misinformation, commonly known as "fake news," poses a significant threat to public discourse and societal trust. In response, developing robust automated detection systems has become a critical area of research. This paper presents the design and evaluation of a deep learning model for classifying news articles using the public ISOT Fake News Dataset. We employ a hybrid CNN-LSTM (Convolutional Neural Network - Long Short-Term Memory) architecture, a model designed to effectively capture both local patterns in text (via the CNN) and long-range sequential dependencies (via the LSTM). The model was trained on a combined feature set of article headlines and body text. The proposed model demonstrated exceptional performance on the dataset, achieving an accuracy of 99% on the unseen test set. The training and validation loss curves converged smoothly, indicating that the model trained successfully without overfitting. However, a deeper analysis of this high accuracy reveals a critical finding: the model's success is strongly linked to a significant dataset bias. The ISOT dataset sources all its "real" news exclusively from Reuters. Consequently, the model has become highly adept at identifying the unique linguistic style of Reuters rather than learning a generalizable pattern for "truth." This paper concludes that while the CNN-LSTM architecture is highly effective for this specific dataset, our findings underscore the critical importance of data diversity and the challenge of dataset bias in creating real-world fake news detection systems that can generalize to unseen sources. Index Terms—Fake News Detection, Deep Learning, Natural Language Processing (NLP), CNN-LSTM, Convolutional Neural Network (CNN), Long Short-Term Memory (LSTM), ISOT Dataset, Dataset Bias.



ABSTRACT

SENTICA - YOUTUBE COMMENT SENTIMENT ANALYZER

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The rise in public-generated content on YouTube has gone up tremendously and therefore, analyzing public opinion has become a most important task for content creators, marketers, and researchers. The authors present SENTICA in this paper, an intelligent sentiment analysis system that aims to interpret the emotions of the commenters in YouTube by means of modern Natural Language Processing (NLP) and Artificial Intelligence methods. The new approach of the system incorporates an entire process where large-scale comment extraction, preprocessing, sentiment classification, and results visualization through an interactive React-based user interface and a Flask-powered backend are done automatically. The classifier of the model categorizes the comments as Positive, Negative, and Neutral on the basis of text polarity and subjectivity scores. Besides that, SENTICA is capable of generating detailed analytical reports together with the temporal patterns, linguistic metrics, and engagement insights. The combination of AI with visual dashboards guarantees the interpretability and usability at the same time, which transforms it into a necessary instrument for both researchers and content managers.

FAKE NEWS DETECTION USING NLP

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The proliferation of online media has significantly changed how information is disseminated, resulting in an unparalleled increase in the propagation of fake news. By influencing public opinion and eroding confidence in reputable media, fake news—which is defined as purposefully produced or misleading material presented as factual—poses significant threats to society. The use of Natural Language Processing (NLP) methods to automatically identify and counteract bogus news is the main emphasis of this study. NLP makes it possible to identify misleading content more accurately by examining linguistic patterns, semantic structures, and contextual indicators inside textual data. The study investigates a number of approaches, including sophisticated transformer based models like BERT and RoBERTa, deep learning architectures like CNN and LSTM, and conventional machine learning algorithms. Model performance is evaluated experimentally on benchmark datasets using metrics including accuracy, precision, recall, and F1-score. The findings show that transformer-based models perform better than traditional methods because they have a better contextual awareness. Despite these developments, problems including multilingual detection, data imbalance, and domain adaptation still exist. The study's conclusion highlights the potential of NLP-driven frameworks in the fight against false information and makes recommendations for future developments, such as explainable AI integration and cross-domain learning for improved transparency and dependability in fake news detection systems.

Index Terms—*Fake News Detection, Deep Learning, Natural Language Processing (NLP), CNN-LSTM, Convolutional Neural Network (CNN), Long Short-Term Memory (LSTM), ISOT Dataset, Dataset Bias.*



ABSTRACT

**STUDENT PERFORMANCE PREDICTION SYSTEM USING ML AND STREAM LIT
INTERFACE**

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Data-driven decision-making is now crucial for raising student achievement in today's educational environment. A machine learning-based Student Performance Prediction System that predicts academic achievement using academic and behavioral characteristics is presented in this study. Based on inputs including attendance, study time, prior grades, parental education, internet access, and involvement in extracurricular activities, the system forecasts a student's performance % and predicts whether they will pass or fail. The system, which was created with Python and Sci kit learn and implemented through Stream-lit, provides educators with an easy-to-use interface to help them make wise selections. Early intervention initiatives for at-risk pupils are intended to improve academic support and institutional effectiveness. The technology demonstrates its potential to transform educational monitoring by achieving an accuracy of over 85% on test datasets through extensive experimentation. By highlighting the importance of characteristics like attendance (correlated with a 0.72 Pearson coefficient to performance) and study hours in predicting accuracy, this work closes the gap between theoretical machine learning models and real-world educational applications.

**TECH-SEVA: A UNIFIED PLATFORM FOR MACHINE LEARNING-BASED
REAL-WORLD SOLUTIONS**

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The widespread usage of machine learning (ML) and deep learning (DL) has brought about revolutionary solutions in a variety of industries, but non-technical consumers are still mostly unable to access their practical use because of complicated environmental setups and the requirement for specialist programming skills. This paper presents Tech-Seva, a unified web-based platform that combines several predictive and analytical models into a single, user-friendly interface in order to democratize access to ML-powered solutions. Tech-Seva tackles important issues like the high barrier to entry for ML experimentation, the dispersion of ML resources, and the lack of accessibility for non-technical users. The platform offers features for important real-world applications, such as fraud detection (using CatBoostClassifier and XGBClassifier on SMOTE-balanced datasets), stock price prediction (using user accounts, and educational modules.



EXPLORATORY DATA ANALYSIS

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Lakhmi Chand Institute of Technology, Bilaspur CG, India

Exploratory Data Analysis (EDA) is not just the most important but also the very first step in data analysis if one could put it that way. Through EDA, the scientific community at least manages to uncover the data's patterns, relationships, and even its hidden structure before the advanced modeling techniques are applied. In the present experiment, a thorough EDA which included displaying the trends, cleaning the data, giving the brief statistics conclusion, and showing the distributions through very powerful methods has been conducted. The analysis that combines descriptive statistics with various graphical methods such as histograms, boxplots, heatmaps, and correlation matrices provides information about data quality, feature interaction, and potential predictors. The areas of decision-making, feature selection, and data-driven model development have been highlighted as the ones where EDA is of great help. The entire study makes it clear that systematic EDA not only aids but also renders the subsequent analytics or machine learning tasks more trustworthy, precise, and transparent.

TOWN ADMINISTRATION COMPLAINT PORTAL

¹Khushi Isha, Sanskar Singh Thakur, ¹Akshit Vaishnav, ¹Prachi Sai, ²Neetesh Kumar Nema

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This paper presents the design and benefits of a proposed Town Administration Complaint Portal an automated system aimed at revolutionizing the current manual grievance redressal process. The portal directly addresses critical shortcomings such as low accountability, zero transparency, inconsistent service times, and inefficient complaint assignment, which are prevalent in existing manual systems. By providing citizens with an intuitive, accessible platform for filing and tracking grievances, the portal will enhance communication through automated updates, foster trust, and significantly reduce the administrative burden associated with manual record-keeping. Furthermore, the system will leverage data analytics to offer the administration consolidated, quantifiable insights into complaint trends, departmental performance, and underlying systemic issues, thereby enabling proactive problem-solving and continuous improvement in public service delivery. The implementation of this digital solution is expected to lead to increased citizen satisfaction, improved operational efficiency, and a more responsive and accountable town administration.

Keywords - *Online Complaint Portal, e-Governance, Grievance Redressal System, Smart City, Digital India, Citizen Engagement, Public Service Delivery, Transparency, Accountability.*



ABSTRACT

**TRAVEL ALLOWANCE PORTAL: A WEB-BASED SYSTEM FOR EFFICIENT
TRAVEL CLAIM AUTOMATION**

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In today's fast-moving digital world, companies are relying more on automated and tech-based tools to run their day-to-day operations smoothly. One of the most common and time-consuming tasks is handling employee travel allowances by hand, which often leads to delays, errors, and extra work. The Travelling Allowance Portal was created to solve this problem by offering a well-organized, clear, and efficient online platform for requesting, approving, and tracking money claims related to travel. The system has three key sections — Administration, Finance, and User (Employee) — each designed to make the process easier and more accountable. The Administration section manages user sign-ups, team coordination, data tracking, and system management, ensuring everything follows the company's policies. The Finance section reviews travel requests, checks expenses against company rules, confirms there's enough budget, and approves or denies claims with clear reasons, helping to protect company funds and prevent misuse. The Employee section provides workers with a simple and secure website where they can log in, enter travel details, upload required documents, and check the status of their claims without needing paper forms. The portal is developed using HTML, CSS, Java, PHP, and MySQL, giving it a user-friendly interface, secure data handling, and strong support for the back end. Overall, the Travelling Allowance Portal helps businesses run more efficiently by using digital tools, making processes more transparent, and reducing the need for manual administrative tasks.

Keywords:- *Travel Allowance Portal, Employee Reimbursement System, Finance Management, Administrative Automation, Web-Based Application.*

PRONUNCIATION EVALUATOR SYSTEM

¹Tanisha Soni , ¹Paridhi Mishra, ¹Sujit Sharma, ¹Kamal kumar Sahu, ²Priyanka Shukla

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The paper presents a pronunciation assessment system written in Python, which combines the speech-to-text (STT) technology and phoneme analysis to evaluate pronunciation accuracy in English. The system records the oral message of the user, converts it into text, recognizes phonemes, matches the phonemes with regular pronunciations, and scores the user out of ten along with customized feedback. It is implemented as a console application and is aimed to help English learners to improve their pronunciation through the provision of immediate and objective feedback. Furthermore, the paper reviews the literature on the current methods, such as deep-learning, acoustic comparison, and fuzzy-logic-based techniques, which allows locating the proposed system in the context of the existing research on pronunciation assessment.

Keywords:- *Speech-to-Text (STT), Pronunciation Assessment, Phoneme Analysis, Python-Based Evaluation System.*



SELFIE-BASED EVENT PHOTO FINDER

Mohammad. Nazil¹, Palak Singh², Rakesh Bidoya³, Neelima Vastrakar⁴
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In situations such as weddings, university parties, or big meetings, picture takers snap loads of shots - so many that people struggle to spot themselves. Instead of scrolling endlessly, folks now use a smart online tool that picks out their faces using photo matching tech. One quick selfie is all it takes to pull up every moment they're in. Photos show up right away, sorted neatly in a simple viewer anyone can navigate.

Key Words: *Face Recognition, Artificial Intelligence (AI), Machine Learning (ML), Computer Vision, Image Retrieval, Event Photo Management, Automation, Deep Learning, Django, OpenCV.*

PRELIMINARY PHYTOCHEMICAL SCREENING OF LEAVES OF HEDYOTISCORYMBOSA(L.)

Rashmi Sharma, Aakanksha Sharma, Rubi Vishwakarma, Manish Dubey
Dept.of Biotechnology & Microbiology,
LCIT College of Commerce and Science, Bodri, Bilaspur(C.G.)

Hedyotis corymbosa (L.) is a medicinal plant also known as Oldenlandia corymbosa, Diamond flower and Gurrubhaji in local language. Hedyotis corymbosa(L.) have bioactive compounds which are used for the treatment of various human diseases and also for healing purpose. Medicinal plants have antifungal, antibacterial and anti inflammation antioxidant activities. The aim of this study was preliminary phytochemical analysis of Hedyotis corymbosa(L.) leaves using aqueous and methanol as polar solvent to find out the phytochemical constituents in the plants. Soxhlet apparatus was used for the solvent extraction. The phytochemical screening of the plant extract revealed that leaves extract showed the presence of maximum compounds including, alkaloids, phenolic, terpenoids, tannin, cardiac glycosides, saponins, steroids and flavonoid compounds. The result suggested that the aqueous and methanolic extract of Hedyotis corymbosa(L.) has promising therapeutic potential and can be used for the treatment and control of various infection caused by microorganism.

Keywords: *Medicinal plant, ethanol extract, photochemical analysis, therapeutic potential, methanolic extract.*



ABSTRACT

IMPACT OF GIG-LABOR OPERATIONS ON SERVICE QUALITY

Ms. Yashvi Sharma Ms. Tulsi Soni

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The rapid proliferation of the gig economy has fundamentally restructured traditional service delivery models, shifting the operational burden from permanent employees to a fragmented network of independent contractors. This research paper, titled "**Impact of Gig-Labor Operations on Service Quality**," investigates the critical intersection between platform-mediated labor management and the resultant consumer experience. While the gig model offers unparalleled organizational flexibility and cost-efficiencies, this study argues that the inherent precarity of gig work—characterized by income volatility, lack of formal training, and high turnover rates—creates significant challenges for maintaining consistent service standards. Utilizing a mixed-methods approach, the research analyzes how algorithmic management systems, which prioritize speed and volume over relationship-based service, influence key quality dimensions such as reliability, responsiveness, and empathy. Preliminary findings suggest a "paradox of flexibility": while digital platforms enhance service availability and reduce wait times, the erosion of organizational commitment and the absence of standardized professional development often lead to a measurable decline in technical service quality and customer satisfaction. Furthermore, the study examines the "poaching" effect, where the migration of skilled labor from traditional service sectors to gig platforms creates a skill gap that further compromises industry-wide benchmarks. By synthesizing empirical data with contemporary labor theories, this paper identifies the systemic barriers—including algorithmic bias and worker burnout—that prevent gig-labor operations from achieving the service excellence found in traditional employment structures. Ultimately, the research provides strategic recommendations for platform operators and policymakers, emphasizing the need for a "social contract" overhaul that balances operational efficiency with the socio-economic stability of the workforce. The conclusions underscore that long-term brand equity and service sustainability in the digital age are inextricably linked to the quality of the labor environment, necessitating a shift toward human-centric operational strategies that protect both the worker and the end-consumer experience.

Keywords: *Gig economy, Gig labor operations, Services quality, Customer satisfaction, Workforce precarity, Organizational flexibility, Human-centric operations, Professional Development.*

INVESTMENT STRATEGY IN EMERGING ECONOMIES

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Investment means proper utilization of savings for earning money in future. Savings means excess between Income and Expenses. In present era so many options are available in economy for investment. Investment is affected by age of investors, nature of job of investors and also gender of investors also give effect on investment. This research paper highlights different types of investment and how investment helps in economic development of society. In economy 2 types of investment available one Government and another one is non government. Government investments are secured but earning from them is in low rates on government investments are risky but their refund is in huge amounts. Research area: This research paper is based on some area of Bilaspur Chhattisgarh. Research methodology: Research paper is based on se primary as well as secondary data how Investment make in which area people interested for investing their savings for theses all data collected by questionnaire and effect of investment in development of society is explained with the help of secondary data.

Keywords: *Investment. Development, Expenses, Primary data, secondary data.*



IMPACT OF ONLINE CONSUMER REVIEWS ON PURCHASE BEHAVIOUR: A SENTIMENT-BASED PERCEPTION STUDY

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In the contemporary digital marketplace, online consumer reviews have become a critical determinant of purchasing behavior, as the expansion of e-commerce and social media encourages shoppers to rely heavily on peer-generated content. This study employs a sentiment-based approach to investigate how review elements—such as tone, star ratings, and perceived authenticity—shape consumer trust, brand perception, and overall purchase intent. By analyzing these dimensions, the research specifically evaluates whether positive sentiment reinforces confidence or if negative feedback exerts a disproportionate psychological influence that discourages transactions. Through a descriptive analysis of primary data collected via structured questionnaires, the findings indicate that while positive reviews effectively increase purchase intention, negative feedback has a significantly stronger impact on risk perception and decision avoidance. Furthermore, the results suggest that verified buyer tags and detailed narratives are more instrumental in building trust than numerical ratings alone. Ultimately, this study underscores the profound importance of electronic word-of-mouth (e-WOM) in the modern era, providing actionable insights for businesses to strategically manage their digital presence, enhance brand credibility, and foster meaningful customer engagement.

Keywords -Online Consumer Reviews, Purchase Behaviour, Sentiment Perception, Electronic Word-of-Mouth (e-WOM), Consumer Trust, Digital Marketin.

IMPACT OF SOCIAL MEDIA REVIEWS ON BRAND PERCEPTION: A DATA MINING STUDY

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The widespread adoption of social networking platforms has fundamentally altered how consumers gather information, evaluate alternatives, and form opinions about brands. Online reviews shared on social media function as electronic word-of-mouth (E-WOM), offering immediate and publicly accessible feedback that strongly influences customer attitudes and brand judgments. This study explores how social media reviews affect brand perception by applying a data mining perspective. The investigation relies on both primary and secondary sources of data. Primary information is obtained through a structured questionnaire distributed to online shoppers, whereas secondary information consists of user-generated reviews collected from social media and e-commerce platforms such as Instagram, YouTube, and online retail portals. To analyze the collected information, data mining methods especially text mining and sentiment analysis—are applied to categorize customer comments into positive, negative, and neutral sentiments and to identify recurring themes affecting brand evaluation. In addition, statistical techniques including percentage analysis and correlation analysis are utilized to determine the association between review sentiment and consumer perception of the brand. The anticipated results suggest that favourable reviews strengthen brand trust, credibility, and buying intention, while unfavourable comments diminish consumer confidence and damage brand image. The study underscores the necessity for organizations to systematically monitor and interpret online consumer feedback. By integrating analytical tools with marketing practices, firms can better manage their reputation, respond to customer concerns, and develop informed strategic decisions.

Keywords: Social Media Reviews, Brand Perception, Data Mining, Sentiment Analysis, Electronic Word-of-Mouth (E-WOM), Text Mining, Brand Reputation Management, Consumer Behavior.



DIGITAL DIVIDENDS OR DIGITAL DIVIDES? ASSESSING EQUITABLE ACCESS TO MODERN BANKING SERVICES

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This research paper, titled "Digital Dividends or Digital Divides? Assessing Equitable Access to Modern Banking Services," investigates the complex paradox of the financial technology revolution. While the rapid digitalization of banking—driven by mobile applications, AI-enabled credit scoring, and blockchain-based transactions—promises "digital dividends" in the form of increased efficiency and lowered costs, it simultaneously threatens to deepen the "digital divide" for marginalized populations. Through a multi-dimensional analysis of global banking trends and socio-economic data, this study examines how factors such as geographic location, age, digital literacy, and infrastructure quality dictate the level of financial inclusion. The research employs a mixed-methods approach to evaluate whether modern banking innovations are democratizing wealth or merely optimizing services for the already tech-savvy elite. Initial findings suggest that while smartphone penetration has expanded access in emerging markets, systemic barriers such as algorithmic bias and the "app-gap" continue to exclude rural and low-income demographics from essential financial instruments. The paper argues that without proactive policy interventions and human-centric design, the digital transformation of banking may inadvertently reinforce traditional socio-economic stratifications. By synthesizing user experience data with regulatory frameworks, this study concludes with a set of strategic recommendations for policymakers and financial institutions to ensure that the transition to a cashless society is both inclusive and sustainable, transforming potential disparities into universal economic opportunities.

Keywords: *Financial Inclusion, Digital Divide, FinTech, Socio-economic Stratification, Algorithmic Bias, Digital Literacy, Democratization of Finance*

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The Service Complaint Management Portal is an online system created to improve and automate the entire workflow of submitting, monitoring, and resolving service-related complaints for IT and electronic equipment used within an organization. In many organizations, requests for device repairs or support—especially for devices purchased from multiple vendors—are handled manually through phone calls, emails, or paperwork. This traditional method often results in slow processing, difficulty in tracking the complaint status, communication gaps, and a lack of responsibility among involved parties. To address these challenges, this project introduces a centralized digital solution where all service complaints can be managed efficiently in one place. The application is developed using PHP as the server-side scripting language, MySQL as the relational database system, and a combination of HTML, CSS, and JavaScript to create an intuitive, responsive, and user-friendly interface. The portal also incorporates a comprehensive Role-Based Access Control (RBAC) model, ensuring that each user interacts with the system according to their designated responsibilities. It supports three main roles: Admin, who manages users, assigns complaints, and oversees system operations; Engineer, who receives and resolves complaints related to products from their assigned vendor; and User (Complainer), who can register issues and track the progress of their service requests.

Keywords: *Workflow automation, Web-based system, PHP, MySQL, Responsive design, Role-Based Access Control (RBAC), Centralized database, Complaint tracking system, Issue reporting module, Admin module, Engineer module, User module, Complainer module.*



ABSTRACT

Solar-Powered Smart Helmet with Safety and Bluetooth Features

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Road accidents involving two-wheeler riders have rapidly increased due to alcohol consumption, ignoring helmet use, and lack of emergency communication systems. Traditional helmets provide only physical protection but do not support intelligent safety features. The proposed Solar-Powered Smart Helmet integrates modern embedded technologies such as Arduino A3, MQ-3 Alcohol Sensor, Bluetooth Communication, Microphone & Speaker, Lithium Battery, Solar Panel, and Ride Indication System to improve road safety. If alcohol is detected, the vehicle ignition is automatically disabled, preventing drunk driving. Bluetooth calling enables hands-free communication for emergency situations. Solar charging provides unlimited power supply, eliminating the need for external charging. This work demonstrates a cost-effective, feature-rich safety system that can significantly reduce accident risks and enable real-time protection. The prototype successfully proves that renewable energy and embedded technology can be used effectively in modern safety helmets.

Keywords: *Solar-Powered Smart Helmet, Embedded Systems, Arduino A3, MQ-3 Alcohol Sensor, Road Safety, Ignition Interlock System, Renewable Energy, Bluetooth Communication, Real-time Protection.*

Assessment of Weed Management Practices and Their Impact on Crop Yield in Dry Seeded Rice Fields in Mungeli District , Chhattisgarh, India

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Rice (*Oryza sativa* L.) is one of the most important staple food crops in India and plays a crucial role in ensuring food security and sustaining rural livelihoods. Traditional rice cultivation mainly follows the transplanting method which requires large amounts of water and labour. Due to increasing water scarcity, rising labour costs, and changing climatic conditions, alternative rice cultivation techniques are gaining importance. One such technique is Dry Seeded Rice (DSR), which involves direct sowing of rice seeds into the field without nursery raising and transplanting. Dry seeded rice has several advantages such as reduced water consumption, lower labour requirements, early crop establishment, and reduced production costs. However, weed infestation is considered one of the most serious challenges in dry seeded rice cultivation. In the absence of standing water, weeds grow rapidly and compete with rice plants for essential resources such as nutrients, water, sunlight, and space. The present study was conducted in Mungeli district of Chhattisgarh to assess weed management practices and their impact on crop yield in dry seeded rice fields. Field surveys, farmer interviews, and quadrat sampling techniques were used to identify dominant weed species and evaluate different weed management strategies such as manual weeding, chemical herbicides, and integrated weed management. The results revealed that weed density was highest in untreated fields, resulting in significant reduction in crop yield. Manual weeding and herbicide application reduced weed population and improved yield, while integrated weed management proved to be the most effective strategy. The study highlights the importance of adopting efficient weed control methods to enhance rice productivity in dry seeded rice systems.

Keywords: *Dry Seeded Rice, Weed Management, Herbicides, Integrated Weed Management, Mungeli District, Chhattisgarh.*



ABSTRACT

Design and Evaluation of Effervescent Buccal Fentanyl Tablets for Rapid Relief of Breakthrough Pain

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Breakthrough cancer pain requires rapid, reliable analgesia, yet conventional oral transmucosal fentanyl formulations often exhibit delayed onset, variable bioavailability, and inconsistent patient adherence. Effervescent buccal tablets of fentanyl offer a novel approach by combining dynamic pH modulation, controlled effervescence, and mucoadhesion to optimize drug delivery. To formulate and evaluate effervescent buccal tablets of fentanyl for rapid and predictable systemic absorption suitable for breakthrough pain management. Fentanyl effervescent buccal tablets were prepared and assessed for physicochemical properties, swelling index, mucoadhesive strength, in vitro dissolution, ex vivo residence time, and drug content uniformity. Standard pharmacopeial methods and texture analysis were employed to ensure mechanical stability, bioadhesion, and accurate dosing. Tablets demonstrated consistent weight (99.2–102.8 mg), hardness (4.2 ± 0.3 kg/cm²), friability (0.42%), and neutral surface pH (6.7 ± 0.2). Swelling index increased progressively to 54% at 6 hours, promoting sustained mucosal contact. Mucoadhesive strength averaged 0.42 ± 0.03 N, supporting retention against saliva and tongue movement. In vitro dissolution studies showed rapid fentanyl release, with >95% released within 30 minutes, aligning with the ex vivo residence time (~23 minutes). Drug content uniformity was excellent ($100.2 \pm 1.4\%$ of label claim), ensuring precise dosing critical for opioid therapy. Effervescent buccal tablets of fentanyl combine rapid dissolution, strong mucoadhesion, and predictable release, offering a robust and patient-centric option for breakthrough cancer pain. The formulation addresses limitations of conventional OTFC lozenges and sublingual sprays, supporting faster onset, higher bioavailability, and improved adherence. Further clinical evaluation is warranted to confirm therapeutic efficacy and safety in oncology settings.

Keywords: *Fentanyl, Effervescent buccal tablet, Breakthrough pain, Mucoadhesion, Rapid analgesia.*



ABSTRACT

**HYBRID SMOTE–PCA STACKED ENSEMBLE MODEL FOR EARLY DIABETES
PREDICTION**

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² Department of Computer Science, Government Bilasa Girls' PG Autonomous College, Bilaspur (CG),

³ Department of Computer Science, Government E.R.Rao PG Science College, Bilaspur (CG),

Diabetes mellitus is a significant metabolic condition and an escalating global public health issue impacting millions of individuals globally. In recent years, machine learning-based predictive models have been found to possess significant potential for early risk stratification in the healthcare sector. However, there are several issues, such as the problem of class imbalance in the data, the high dimensionality of the features, overfitting, and the lack of generalizability across cohorts, that are still hindering the application of predictive models. To address the aforesaid limitations, the current research work proposes a stacked ensemble learning paradigm for the early-stage diabetes prediction problem based on the given set of features. The proposed architecture combines the strengths of multiple base classifiers, such as Logistic Regression, Support Vector Machine, Decision Tree, Random Forest, and Naïve Bayes. To avoid the problem of class imbalance, the Synthetic Minority Oversampling Technique (SMOTE) is also integrated with the cross-validation mechanism for the generation of synthetic minority class samples without compromising the data leakage problem. In addition, Principal Component Analysis (PCA) is also employed for orthogonal feature transformation and dimensionality reduction, which reduces the redundancy and noise associated with the features. The performance of the suggested model is validated through the usage of stratified k-fold cross-validation techniques, and different evaluation parameters, namely Accuracy, Precision, Recall, F1-score, and Area Under the Receiver Operating Characteristic Curve (AUC-ROC), are employed for evaluating the performance of the suggested model. The experimental results validate that the stacked ensemble model outperforms other individual classifiers, which indicates better predictive performance for the stacked ensemble model. The suggested framework has great potential for providing an efficient, reliable, and scalable solution for diabetes risk stratification, which can be utilized for developing an intelligent clinical decision support system for early diagnosis and prevention of diabetes.

Keywords: *Diabetes Mellitus, Machine Learning (ML), Ensemble Learning, Synthetic Minority Oversampling Technique (SMOTE), Principal Component Analysis (PCA), Clinical Decision Support System (CDSS)*

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2012

The Company was Established.



500+

Internet Software Products for Market audience



250+

Customers



20+

Business partners

Business Partners Around The World



United States of America



United Kingdom



United Arab Emirates



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Our Vision

To empower businesses and individuals through innovative technology solutions, fostering resilience and growth in an ever-evolving digital landscape. We envision a future where technology seamlessly integrates with human ingenuity, enabling organizations to thrive and make a meaningful impact.



Our Mission

To design, develop, and deliver exceptional software and web solutions that meet the unique needs of our clients, exceeding their expectations and driving their success. Delivering top-notch solutions that meet the highest standards of quality and innovation.



Balaji Jewellers provides you the best range of silver jewelry, necklace set & silver coin with effective & timely delivery.

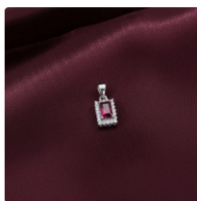
There are many businesses across India named Balaji Jewellers, some are local jewellery shops with retail sales and others are brand sites or online jewellery businesses offering silver and gold pieces. For example, there are online silver jewellery brands or stores in places like Rajasthan and Chennai (not necessarily connected to the local shops listed above).

Why Balaji Jewellers Is a Common Name

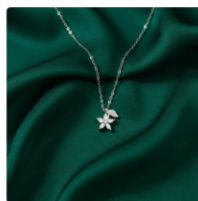
Balaji is a popular name in India — often used in business names, especially in retail and jewellery — due to cultural significance (associated with Lord Venkateswara/Balaji). Because of this, Balaji Jewellers doesn't point to one single nationwide brand — instead, it can refer to many different independent jewellers or small chains operating in different regions, each with their own offerings and specialties.

Chain Pendant

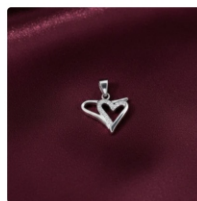
Express your love with us



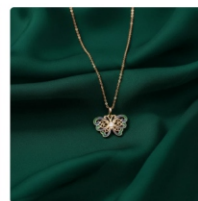
Emerald-Cut Crimson Ruby Halo Pendant in Sterling Silver
Rs. 1,449.00



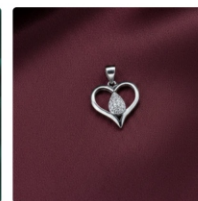
Dainty Silver Floral Marquise Zircon Pendant Necklace
Rs. 1,699.00



Eternal Heart Sterling Silver Chain Pendant
Rs. 1,449.00



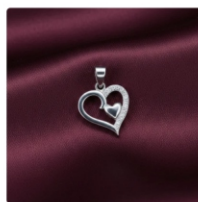
Enchanted Filigree Butterfly Pendant in Rose Gold And Enamel
Rs. 1,699.00



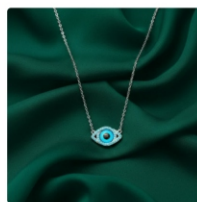
Eternal Heart Teardrop Chain Pendant Sterling Silver & Cubic Zirconia
Rs. 1,449.00



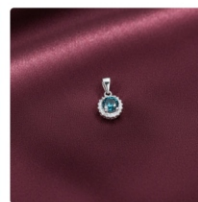
Eternal Love Heart Dancing Stone Silver Necklace
Rs. 1,699.00



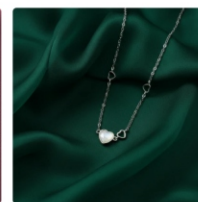
Eternal Love Sterling Silver Double Heart Chain
Rs. 1,449.00



Evil Eye Turquoise Zirconia Pendant Sterling Silver Necklace
Rs. 1,699.00



Midnight Ocean Halo Chain Pendant
Rs. 1,449.00



Iridescent Mother Of Pearl Heart Station Necklace In Sterling Silver
Rs. 1,699.00



Shree Abhivadya Pure Veg Fine Dine Restaurant and Hotel Dwarka Inn — a well-reviewed restaurant and hotel in Bilaspur, Chhattisgarh (about ~90 km from Ratanpur, Chhattisgarh India):

About the Place

Type: Pure vegetarian fine-dine restaurant and hotel with dine-in (and usually delivery/takeaway options).

Cuisine: North Indian, Chinese & multi-cuisine veg menu — popular with families and groups.

Location & Contact

Address: Indu Imperial, behind New High Court, Chhatauna Road, Bodri, Bilaspur, Chhattisgarh – 495003, India.

Phone: +91 77373 73442 (for reservations or inquiries).





Mahavir Coal Group

Established in 1990 as a proprietorship concern, the firm is registered as a PRIVATE LIMITED COMPANY IN 2008. The company is managed by highly experienced and knowledgeable technocrats and business minded staff having numerous years of experience.

Mahavir Coal Resources Pvt. Ltd. (MCRPL)

It is a noteworthy Coal (World's Fossil Fuel) Trader, Liasoning agent and Transporter. Company supplies coal, Washed Coal, Imported coal etc to industries like Power, Cement, Chemicals, Steel and hundreds of medium and small scale industries. MCRPL has direct access to mines of SECL, WCL, NCL, BCCL, ECL, CCL and MCL as well as to various indonesion coal mines.

Our Infrastructure

The company is managed by highly experienced and knowledgeable technocrats and business minded staff having numerous years of expertise. Our infrastructure consists of modern and high tech equipment, with innovative technology machines enabling us to provide flawless services within the stated time schedule.





Maruti Suzuki ARENA (M Square Motors, Bilaspur, Parsada Raipur Road)

Our Story, Your Journey

M Square Motors is one of the leading Automobiles dealership of Maruti Suzuki in Bilaspur Area. It is a part of MahavirMotorcorp Pvt. Ltd. a company incorporated on February 20, 2019. Mr. Pramod Kumar Jain, Mr. Ankit Jain and Mr. Ankur Jain are the main promoters of M Square Motors. Being India's Second & Chhattisgarh's First largest fully digitized showroom, M Square Motors has 3S facility providing all services like- MSIL, MSGP, MSGA under one roof.

Our Address

M Square Motors (A Unit Of Mahavir Motorcorp Private Limited)

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HDFC Bank offers a full range of banking and financial services including:

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