Shodha Nidhi - 2025

A COMPENDIUM OF RESEARCH PUBLICATIONS VOL - VIII

ST JOSEPH ENGINEERING COLLEGE

An Autonomous Institution

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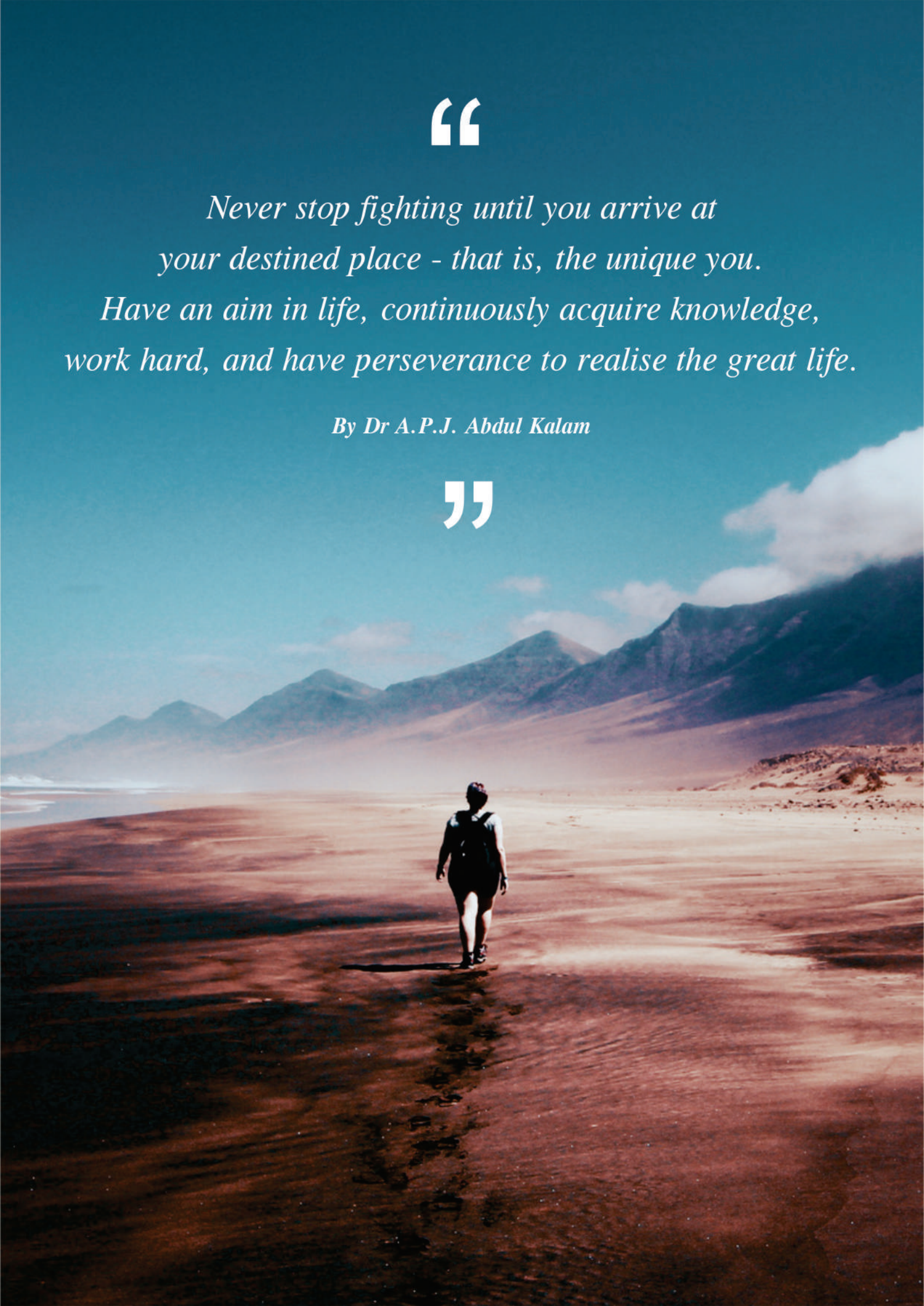
“
Never stop fighting until you arrive at
your destined place - that is, the unique you.
Have an aim in life, continuously acquire knowledge,
work hard, and have perseverance to realise the great life.
By Dr A.P.J. Abdul Kalam
”

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Message from the DIRECTOR

It is with profound pride and optimism; I am delighted to unveil the ***Eighth Volume*** *of the* ***'Shodha Nidhi - 2025'*** *- A Compendium of Research Publications of SJEC. This volume is more than a record of scholarly output—it is a celebration of ideas that challenge conventions, inspire progress, and contribute meaningfully to society.*

In an era defined by rapid change and complex global challenges, research serves as a powerful catalyst for innovation and responsible leadership. The studies featured in this compendium demonstrate the depth of inquiry, interdisciplinary and collaborative spirit, and forward-looking vision of our researchers. Each contribution represents a step toward shaping a more informed, equitable, and sustainable future. I place on record my sincere appreciation to our faculty members for their consistent efforts in publishing the scholarly output in the peer-reviewed journals.

I extend my sincere appreciation to Dr Felcy DSouza, Librarian and the editorial team for their efforts in bringing this compendium to fruition.

I am confident that ***'Shodha Nidhi-2025'*** *will serve as a source of inspiration for researchers, students, and academic peers, while inspiring greater research participation and collaboration in the years to come.*

God bless you all.

Rev. Fr Wilfred Prakash D'Souza
Director

Message from the ASST. DIRECTOR

"Everything is theoretically impossible, until it is done." Robert A Heinlein

I am delighted to announce the publication of ***"Shodha Nidhi-2025"-*** *A compendium of research publications from St Joseph Engineering College, encompassing the year 2025. My heartfelt congratulations to the Librarian and her dedicated team for their efforts in making this achievement possible. I extend my warmest appreciation to our researchers who, through their unwavering dedication, have contributed to various esteemed journals, bringing prestige to SJEC.*

Things which seem impossible theoretically can be proved as possible only through research. Academicians have a great role in fulfilling the gap when theory needs evidence. This collection of research articles from the faculty of St Joseph Engineering college is a celebration of that spirit. It's a reminder that learning is a journey, not a finish line.

What you will find in this compendium are not just articles, but journeys of thought, effort, and learning. Each piece represents someone who chose to begin and to continue, often balancing challenges with perseverance. Rooted in our commitment to Service and Excellence, these contributions reflect the belief that research is not only about rigour, but about using knowledge responsibly and sharing it for the good of others. May these pages encourage you to remain curious, attentive, and open to growth as we continue this journey of inquiry together.

Rev. Fr Kenneth Rayner Crasta
Assistant Director

Message from the PRINCIPAL

I am happy to see the Annual Research Compendium, ***Shodha Nidhi- 2025*** *abstracts of faculty research publications from the past year, meticulously compiled by our dedicated team.*

"Great scientific advances spring from pure research." – Jacques Cousteau

Congratulations to the team on the exceptional work and unwavering dedication! The readers are warmly recommended to dive into these abstracts for inspiration and insight.

With Best Wishes

Dr Rio D'Souza
Principal

Message from the
OFFICE OF THE DEAN
RESEARCH & DEVELOPMENT

It gives me great pleasure to present ***"Shodha Nidhi - 2025"*** *- A Research Compendium of St Joseph Engineering College, Mangaluru. Research and innovation continue to be the cornerstones of technological advancement and sustainable development. As engineering educators and researchers, we carry a collective responsibility to generate knowledge that addresses contemporary challenges and contributes meaningfully to societal progress.*

Over the past year, SJEC has made steady strides in strengthening its research ecosystem. Our continued emphasis on fostering a vibrant research culture has been supported through structured initiatives such as publication and project grant incentives, seed funding for research, research awards, conference participation support, and publication assistance. These initiatives are aimed at enabling quality research, promoting interdisciplinary collaboration, and enhancing the visibility and impact of our scholarly contributions.

With a committed and dynamic faculty community, SJEC is well positioned to further expand its academic and industrial research footprint. I encourage all faculty members to actively engage in high-impact research, explore funded projects and intellectual property generation, collaborate across domains, and mentor students in innovative research endeavors.

Let us continue to build on our collective strengths, uphold the values of academic excellence, and reinforce SJEC's reputation as a center of research, innovation, and knowledge creation.

Dr Purushothama Chippar
Vice Principal

Editorial

It is with great pride and pleasure that we present the ***Eighth Volume*** *of the* ***"Shodha Nidhi"*** *A Compendium of Research Publications, showcasing the scholarly output of our faculty during the year 2025. This compilation reflects our institution's sustained commitment to academic excellence, research integrity, and knowledge dissemination.*

This volume features 225 research publications of our faculty members published in reputed international journals, conference proceedings, books, and book chapters. Out of these 79% were published in International Journals, 16% in International Conference and others in National Journal and Book Chapters.

We congratulate all contributors on their commendable achievements and look forward to continued innovation, impactful research, and meaningful contributions to society in the years ahead.

Our sincere gratitude to the Management, Principal Dr Rio D'Souza and Dr Purushothama Chippar Dean R&D for their constant support, valuable advice, and motivation in bringing out this volume. Our sincere thanks to Dr Felcy D'Souza Librarian, Editorial Board members and Library Staff for their constant support in compiling the research publications.

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IJ-26	Dayanand M Goudar Mehabubsubahani R Alavandi Subraya Krishna Bhat Raghukumar Bommenahalli Rajashekar V Kurahatti Deesy G Pinto K Raju	Effect of nickel on the mechanical properties of spray-formed Al-15Si-2Cu alloy at elevated temperatures	Journal of Alloys and Compounds,1040, 2025, pp 1-16	94
BC-27	K Raju M Ajay Kumar Canute Sherwin	Arduino-based battery-operated multipurpose portable seed-sowing machine	Digital Convergence in Intelligent Mobility Systems, 2025, pp 1-23	95
IJ-28	Fatima Carneiro Maria Serodio Henriqueta Novoa Andre M Carvalho Jiju Antony Shreeranga Bhat E V Gijo	Spice quality: a six sigma approach to increasing SCAN colour in a paprika production process	International Journal of Productivity and Performance Management, 74(10), 2025, pp 3621-3648	96
IJ-29	M Sudheer B Ravikiran Kamath Raja Yateesh Yadav Vidyasagar Shetty Rajath P Akshara Chidambar Kadoli G Sanjay Pai Akash Vishwanath	Wear performance of polymer matrix composites reinforced with aramid fibers and modified with ceramic nano-powders	Journal of Environmental Nanotechnology, 14(2), 2025, pp182-188	97
IJ-30	Vijay V S Ravikantha Prabhu Purushothama Chippar Rajesh Belchada Madhavi Gatty	Impact of AICTE IDEA lab training on skill development of diploma college students in advanced manufacturing	Journal of Engineering Education Transformations, 38(SI-2), 2025, pp 405-411	98
IJ-31	Rolvin D'Silva Binu K G Glenson Toney Sathyendra Bhat	Evaluating the impact of participation in the SAEINDIA collegiate club activities on engineering education	Journal of Engineering Education Transformations, 38,(SI-2), 2025, pp 38-46	99

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IJ-32	Ashwin Shetty Thirumaleshwara Bhat Ananda Hegde Sathyashankara Sharma Ravikantha Prabhu	Dry sliding wear behavior of SiC-reinforced Al-Si eutectic metal matrix composite	Scientific Reports, 15(1), 2025, pp 1-14	100
IJ-33	Dinesh Kumar Rao Chandra Kant Kaithwas Naman Jain Udayashankar Shivaramakrishna Jagadeesha Thimmaiah Dayanand M Goudar Deesy G Pinto Subraya Krishna Bhat Kandavalli Raju	Analysis of thermal and dynamic mechanical properties of epoxy bio-composites reinforced with sisal fibers and carbon nanotubes	Scientific Reports, 15(1), 2025, pp 1-12	101
IJ-34	Ashwin Shetty Thirumaleshwara Bhat Ananda Hegde Sathyashankara Sharma Ravikantha Prabhu Nithesh K	Effect of magnesium solubility in eutectic Al–Si matrix SiC composites on the mechanical properties	Journal of Materials Research and Technology, 39, 2025, pp 2256-2263	102
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IJ-37	Poornesh Mangalore Jaimin Samabhai Gamit Mithun Kanchan	Developing a framework for sustainable engineering education through transformative learning principles	Discover Sustainability, 6, 2025, pp 1-32	105
IJ-38	Santhosh Poojary Sushanth H Gowda	A comparative study on diesel engine performance characteristics with hybrid blended biodiesels	International Journal of Mechanical Engineering, 12(11), 2025, pp 55-66	106
IJ-39	Roshni Yeshwanth Prashanth Kumar Ravikantha Prabhu	Social and economic impact of sahaja samrudha on sustainable agriculture in Karnataka	Journal of Social Entrepreneurship Theory and Practice, 4(1), 2025, pp 46-62	107
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IJ-3	Surekha Nayak Anjali Ganesh Shreeranga Bhat Roopesh Kumar	Routing TQM through HR strategies to achieve organizational effectiveness: the mediating role of HR outcomes in India	The TQM Journal, 37(2), 2025, pp 289-318	110

IJ-4	Abhaya Kumar Kepulaje Prakash Pinto Iqbal Thonse Hawaldar A A Bhavan Nanaiah K G Ramesh Virgil Popescu Ramona Birau	Arbitrage opportunities in the energy equity futures - a study from Indian perspective	Multidisciplinary Science Journal, 7(1), 2025	111
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BC-6	Iqbal Thonse Hawaldar Anjali Ganesh Roopesh Dsouza Prima Frederick	Empowering skill development: a dual perspective on revitalizing student engagement	Sustainable Data Management, Studies in Big Data, 170, Springer, 2025, pp 589-600	113
BC-7	P Ananth Alias Rohith Bhat Prakash Pinto Iqbal Thonse Hawaldar B Shakila	Dynamics of return and volatility interactions between exchange rates and NSE sectoral indices: a comparative analysis pre and post COVID-19 pandemic	Sustainable Data Management, Studies in Big Data, 171, Springer, 2025, pp 426-436	114
BC-8	P Ananth Alias Rohith Bhat B Shakila Prakash Pinto Iqbal Thonse Hawaldar	Volatility spillover effects between indian textile companies and exchange rate: a BEKK-GARCH analysis	Sustainable Data Management, Studies in Big Data, 171, Springer, 2025, pp 195-206	115
IJ-9	Roopesh Kumar Sandhya Madhava Anjali Ganesh Ravikantha Prabhu Raghavendra	The effect of post-merger technological integration on customer satisfaction and continuance intention in the Indian banking sector	Journal of Economic and Administrative Sciences, 2025, pp1-16	116
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IJ-98	Ajith M M Sunith Kumar T	The impact of NoSQL databases on data management and analysis in smart cities	International Journal of Multidisciplinary Research in Science, Engineering and Technology, 8(6), 2025, pp 10118-10123	216
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IC-100	Hareesh B Akhila S Nayak Gururaja S Murari B K Jayashree M Nishmitha J	Harnessing machine learning for real-time yoga pose detection	Proceedings of the International Conference on Intelligent Systems and Pioneering Innovations in Robotics and Electric Mobility, Mangalore, 20-21 November 2025, pp 671-676	218

IC-101	Sumangala N Pawan Kumar K P	Lung cancer prediction system using CNN and machine learning algorithms	Proceedings of the International Conference on Intelligent Systems and Pioneering Innovations in Robotics and Electric Mobility, Mangalore, 20-21 November 2025, pp 647-652	219
IC-102	Sumangala N K J Dhrithi	Data driven crop yield forecasting	Proceedings of the International Conference on Intelligent Systems and Pioneering Innovations in Robotics and Electric Mobility, Mangalore, 20-21 November 2025, pp 665-670	220
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IJ-2	Jostol Len Pinto Jayanth Ganiga G K Kavya	Thermal characterization of sustainable areca husk fibre reinforced polyester composites for insulation	International Journal of Applied Research, 11(11), 2025, pp 68-72	223
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SUMMARY OF PUBLICATIONS 2025

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IC	12	6	-	10	3	-	-	5	-	**36**
IJ	5	7	6	15	1	36	6	97	5	**178**
NJ	-	-	-	-	-	-	1	-	-	**1**
BC	2	-	-	1	-	3	4	-	-	**10**
TOTAL	**19**	**13**	**6**	**26**	**4**	**39**	**11**	**102**	**5**	**225**

IC–International Conference, **IJ**- International Journal, **NJ-** National Journal**, BC**- Book Chapter

COMPUTER SCIENCE ENGINEERING

Verification and Analysis of Covid-19 Diagnostic Process using the Concept of Process Mining

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ABSTRACT

The concept of Process Mining was employed to explore and analyse the Covid-19 testing process, from initial sample collection (pre-analytical) stage to the final, post-analytical stage of results being dispatched, with an aim to refine and improvise the entire process. The techniques of process mining (PM) namely 'discovery' was employed to extract control-flow of activity executions; 'compliance verification' to detect non-conforming activities; and 'enhancement' to suggest corrective and preventive actions. Extensive analysis of the diagnostic laboratory case study revealed that Process Mining methodology may be effectively applied in discovering the workflow of various Covid-19 testing methods, recognizing causes for delayed turn-around-time, adherence to compliance from control-flow and timing perspectives as well as statistics of machine utilization were also obtained from an organizational perspective.

**Full paper: Deep Learning and Computer Vision: Models and Biomedical Applications, Algorithms for Intelligent Systems, DOI:https://doi.org/10.1007/978-981-96-3648-8_7, Vol 2, Springer, Singapore, 2025, pp 129-156.*

Cyberbullying Detection in Low Resource Code-Mixed Languages using ML and NLP Techniques

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ABSTRACT

Cyberbullying has become a pervasive issue on social media platforms, necessitating effective detection methods across diverse linguistic contexts. This study proposes a methodology for cyberbullying detection in Kannada, Kannada written in English, and English texts. Leveraging machine learning and natural language processing techniques, we develop and evaluate three types of models: traditional (Random Forest, Support Vector Machine), neural network (Single-Layer Perceptron, Multi-layer Perceptron), and deep neural network (Long Short-Term Memory, BERT, IndicBERT). Results show that deep learning models, particularly those leveraging pre-trained language models, exhibit superior performance in detecting offensive language, contributing to the ongoing efforts to combat cyberbullying in contemporary discourse. The model BERT outperforms the Random Forest model by 5.40 in accuracy and 13.79 in *F*1-score. Similarly, the Semi-Supervised model surpasses the Logistic Regression model by 10.62 in accuracy and 19.37 in *F*1-score, highlighting significant improvements. Additionally, an analysis of the underlying mechanisms highlights the inherent strengths of deep learning architectures, such as their ability to capture intricate linguistic patterns and contextual nuances, as well as model long-range dependencies within textual data, thereby enhancing their discriminatory capabilities in identifying cyberbullying behavior across multilingual and cross-script contexts.

**Full paper: Artificial Intelligence: Theory and Applications, Lecture Notes in Networks and Systems, DOI: https://doi.org/10.1007/978-981-96-1687-9_12, Vol 5589. Springer, Singapore, 2025, pp 191-203.*

MultiNet: A Lightweight Deep Learning Group of Models for Fruit Maturity Detection

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ABSTRACT

Deep learning based techniques are contributing value to the supply chain of the crops by executing tasks such as crop inspection, grading, maturity detection, disease recognition. Designing lightweight (low trainable parameter count) deep learning models for fruit maturity detection is an active research area and to address this, the following objectives are framed (i) to design a deep learning model for fruit maturity detection (ii) to reduce the trainable parameter (TP) count and model size in the proposed model than existing models under comparison. (iii) to achieve equivalent or better model performance than existing models under comparison. MultiNet is proposed to achieve the said objectives. MultiNet is a group of deep learning models i.e. (i) MultiNet-none (ii) MultiNet-eca (iii) MultiNet-cbam, trained for fruit maturity detection of guava, date, pomegranate, tomato. The architecture of MultiNet consists of proposed MNet modules designed to reduce TP count and model size (in MB). Between cascading MNet modules, the attention modules named eca, cbam may be present or absent (none) based on which the variants are named. The trained models are evaluated for (ii) reduction in model size along with TP count (iii) recall, accuracy, F1-score, precision. MultiNet group of models are compared with existing Resnet18, MobileNetV3, Xception, Squeezenet. MultiNet reports upto reduction in model TP count and upto reduction in model size making MultiNet “lightweight”. MultiNet has achieved accuracy value of upto which is on par with existing models.

**Full paper: Measurement: Digitalization, DOI: https://doi.org/10.1016/j.meadig.2025.100012. Vol 4, 2025, pp 1-7.*

An Efficient Node Embedding Approach via Adaptive Graph Recurrent Autoencoder with Attention Procedures

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ABSTRACT

Graphs serve as a vital data representation model across various real-world applications including biological research and social network analysis. Many machine learning approaches need a high ability to effectively learn and extract insights from graph structures. Graph embedding plays a crucial role in transforming non-Euclidean feature spaces into low-dimensional structured representations, so it can be easily utilized by machine learning methods. However, the complexity of graph representation learning, especially in node classification tasks arises from the intricate interactions among the labelled information, node attributes, significant features, topological structures, and node types. Current graph convolutional networks (GCNs) often struggle with missing node attribute issues and exhibit inefficiencies during the propagation of information. Hence, an efficient node embedding technique is introduced in this research work to overcome the limitations of the classical techniques. Initially, the graph data needed for performing the node embedding process is obtained from different benchmark sources. Next, the random walk regularization-based node representation learning is introduced to learn the node attributes as it helps to analyse the potential node representation. The random walk model is used in this work, as it has the efficiency to collect and convert the geometric structure into a structured sequence. Then, an efficient network named Adaptive Graph Recurrent Autoencoder with Attention Network (Ada-GRAE-AN) is implemented to execute the node embedding procedures. The developed framework utilizes the attention mechanism to distinguish the importance of neighbouring nodes. Moreover, the parameters in Ada-GRAE-AN are optimized using an Improved Random Parameter-based Piranha Foraging Optimization Algorithm (IRP-PFOA). The major objective of the developed framework is to improve the node embedding with graph labelling information, including the structural information in the node embedding process and enhance the downstream task performance. The developed framework enhances the task performance by classifying the nodes and also predicting the links. Further, various experimental validations are performed in the developed framework over the classical techniques to ensure its effectiveness.A

**Full paper: Knowledge and Information Systems, DOI:https://doi.org/10.1007/s10115-025-02599-9, Vol 67, 2025, pp 12459-12494.*

Predicting Urban Vartur Lake Health: A Multi-context Machine Learning Approach to Water Quality Assessment

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ABSTRACT

This study introduces a novel multi-context approach to water quality assessment by examining the factors influencing Chemical Oxygen Demand in Varthur Lake, Bangalore. Integrating traditional regression techniques with advanced machine learning models, this research analyzes eight water quality parameters collected over two years (July 2022–September 2024). Exploratory Data Analysis is employed to understand parameter distributions, relationships, and trends. Five distinct environmental contexts affecting COD are identified, and various machine learning models are evaluated for COD prediction within each context. Results indicate that Random Forest models yield superior accuracy, with Gradient Boosting offering a viable alternative. This multi-context framework provides a comprehensive understanding of Varthur Lake's water health and offers a scalable approach for predictive water quality monitoring applicable to other urban water bodies.

**Full paper: Journal of the Institution of Engineers (India): Series A, DOI: https://doi.org/10.1007/s40030-025-00881-1, Vol 106, 2025, pp 577- 590.*

Antimagic Labeling of Digraphs

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ABSTRACT

A directed graph D can be labeled antimagically by assigning different integers to its arcs, ensuring that the computed vertex weights are distinct. Antimagic labeling exists in a digraph D with h arcs and g vertices if it is possible to uniquely match each arc to an integer from 1 to h. For every vertex, the difference between the totals of the labels from incoming arcs and outgoing arcs is unique for each vertex. A directed graph that allows such antimagic labeling is referred to as an antimagic digraph. There are countless methods to create an antimagic digraph. These constructions are essential in fields such as network theory, coding theory, and combinatorial optimization. The subset sum problem is a well-recognized issue in both computer science and combinatorics. These problems play a decisive role in graph labeling, especially when it comes to the creation and evaluation of specific types of labels. In this paper, we connect the idea of subset sum problems with wheel digraphs $\overrightarrow{W}_n$ to represent it as antimagic. The Cartesian product of directed graphs is a fundamental concept in graph theory that holds both theoretical and practical importance. The applications of Cartesian products include network design and analysis, parallel computing, graph decomposition and construction, Game Theory, and Decision-Making. Additionally, in this paper, we have developed antimagic digraphs from the Cartesian product of directed path Pn and $\overrightarrow{K}_2$ by traversing the directed path $\overrightarrow{P}_n$ in alternating and unidirectional ways.

Full paper: Mathematics and Statistics, DOI: 10.13189/ms.2025.130205, Vol 13, Issue No. 2, 2025, pp 105-109.

Improving Subscriber Retention: A Machine Learning Approach with Random Forest and SMOTE

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ABSTRACT

For subscription-based companies, especially those in the telecom sector, customer attrition is a serious problem. Using machine learning techniques and the Telco Customer attrition dataset, this research forecasts customer attrition. Strong data preprocessing, feature engineering, and predictive modeling with cutting-edge algorithms like LightGBM and Random Forest as well as a Voting Classifier to improve accuracy are all part of the approach. SMOTE ensures balanced forecasts by addressing class imbalance. Effective retention tactics may be implemented by stakeholders thanks to an intuitive dashboard that offers real-time projections, churn patterns, and interactive visualizations. This project provides a complete solution to enhance business results and lower churn rates.

**Full paper: Proceedings of the Sixth International Conference on Inventive Research in Computing Applications (ICIRCA), DOI: 10.1109/ICIRCA65293.2025.11089606, Coimbatore, 25-27 June 2025, pp 919-925.*

Hybridisation of Graph Convolutional Neural Networks and Residual Attention Network for Early Identification of Plant Diseases

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ABSTRACT

Due to the limitation in the existing infrastructure, the recognition of plant disease has becomea crucial task, because crop diseases are considered as the major threat in terms of foodsecurity in all parts of the world. Hence, earlier prevention and timely detection are regarded asthe two major factors for effectively enhancing the rate of production. Hence, automatedcomputational systems are designed for diagnosing plant leaf diseases. At first, the standardimages of plant leaf are gathered from online sources and given into pre-processing phase.Next, the pre-processing is done using optimally weighted threshold histogram equalization,where weights are optimized using Enhanced Sandpiper Optimization Algorithm (ESOA).Outcomes are then, directly fed to the Hybrid deep learning strategy with the hybridizationof Residual Attention network (RAN) and Graph Convolutional Neural Networks (GCNN) termedas GCNN-RAN, in which the same E-SOA is used for optimizing the parameters of GCNN andRAN. The accuracy and precision rate obtained from the recommended approach are 97.33%and 96.5%, which shows the disease detection in plant leaf accuracy is more impressive thanpreviously developed models. Thus, the newly developed model is useful for detecting thedisease over the plant leaf in an effective manner.

Full paper: Australian Journal of Electrical and Electronics Engineering, DOI:https://doi.org/10.1080/1448837X.2025.2528454, 2025, pp 1-21.

IoT-Driven Smart Home Automation: A Comprehensive Approach with ESP32 and Cloud Service

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ABSTRACT

The Internet of Things' quick development and widespread availability have made home automation a topic of interest. The study introduces an innovative smart home automation system utilizing IoT technology, featuring an ESP32 module as the central server and Wi-Fi for communication. By integrating sensors, switches, and a smartphone-based control interface through the Android IoT Cloud platform, the system allows both manual and remote management of home appliances. Key benefits include real-time environmental monitoring, twoway control, and enhanced safety. Automation elements, such as a stepper motor for precise control of blinds, are also incorporated. The research demonstrates IoT's potential for enhancing home automation and sets the stage for future advancements in the field.

**Full paper: Proceedings of the Sixth International Conference on Mobile Computing and Sustainable Informatics (ICMCSI), DOI: https:// 10.1109/ICMCSI64620.2025.10883386, Goathgaun, Nepal, 07-08 January 2025, pp 655-664.*

A Comprehensive Survey on Cutting-Edge Multi-Object Detection Techniques in Real-World Scenes using Deep Learning

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ABSTRACT

Object detection (OD) and localization are essential tasks in the field of computer vision. Real-world applications namely facial recognition, augmented reality (AR), video surveillance medical imaging, and autonomous vehicle driving requires highly reliable and cost-effective approach to detect and localize objects. Conventional machine learning (ML) approaches namely viola -jones, scale-invariant feature transform (SIFT) and histogram of oriented gradients (HOG) enormously relies on manual procedure of feature representations and often struggled with variations in lighting and occlusion problems. Eventually, deep learning (DL) techniques replaces these traditional methods with capability of essential features learning automatically and handling large-scale datasets more efficiently. This article highlights popularity of DL models namely convolutional neural networks (CNNs), region-based CNN (R-CNN), single shot multi-box detector (SSD) and you only look once (YOLO) that exhibits superior performance than classical methods. Recently, a significant shift from supervised to unsupervised approaches to overcome the reliance on large, annotated datasets have made OD increasingly robust, scalable, and adaptable across various domains. Modern techniques namely FreeSOLO, transformer-based and adversarial-based detectors overcome annotations overhead and improve novel or unknown OD performance. At the end of the research article, anticipated research trends in OD domain are high-lighted.

**Full paper: Proceedings of the Ninth International Conference on Inventive Systems and Control (ICISC), DOI: https://10.1109/ICISC65841.2025.11187970, Coimbatore, 12-13 August 2025, pp 318-325.*

Real-Time Smart Bin Overflow Monitoring with YOLOv7

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ABSTRACT

Urban waste management has emerged as a critical challenge, especially with the rising population density in cities. Overflowing garbage bins contribute to environmental degradation, unsanitary conditions, and public health hazards. Traditional methods of monitoring and managing waste are time-consuming, inefficient, and reliant on manual inspection, often leading to delayed waste collection. The YOLOv7 (You Only Look Once) object detection model is used in this proposed system for building a deep learning-oriented system for the detection and control of overflowing garbage containers. The system processes images and real-time video streams to identify bins that are overflowing and in need of immediate collection. Further integrate this model into a web application that allows users to report complaints, view bin locations, and track the status of garbage collection. A publicly accessible dataset was used to train the proposed system, and performance metrics like recall, precision, and mAP (mean average precision) were used to measure its impact. With a precision of 0.882 and a recall of 0.863, the YOLOv 7 model showed exceptional accuracy in identifying overflowing bins. Furthermore, the web application's integration enhances the effectiveness of urban waste collection systems by offering an interface that is easy to handle for both residents and waste management administrators. The implementation of this system can significantly reduce the delay in waste collection and improve the overall hygiene and cleanliness of cities, making it a scalable and cost-effective solution for urban waste management.

**Full paper: Proceedings of the Sixth International Conference on Electronics and Sustainable Communication Systems (ICESC), DOI: https:// 10.1109/ICESC65114.2025.11212318, Coimbatore, 10-12 September 2025, pp 679-684.*

Radiographic Age Estimation using Pulp/Tooth Ratio

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ABSTRACT

Age estimation in mature individuals is a pivotal aspect of forensic medicine and holds high importance in both anthropological and forensic contexts. Several medical techniques has been employed for age estimation, where dentition serves as a reliable indicator due to its durability and resistance to environmental and physiological changes. Among the available dental method "The Pulp Tooth area ratio(PTR)" offers empirically derived, non-intrusive approach using radiographic analysis. This study employs panoramic radiographs of specific mandibular teeth to determine the ratio between the pulp chamber area and the total tooth area. The "PTR method" is implemented using "Convolutional Neural Network(CNN) model" based on the principle of advance aging, secondary dentin layers up in the pulp chamber gradually diminishes the size of the pulp chamber. This change provides a indicator for age estimation. The developed deep learning model based system achieved an accuracy of 98 % for canine identification, 96 % accuracy for pulp identification and 65 % accuracy for age estimation.

**Full paper: Proceedings of the International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER), DOI: https://10.1109/DISCOVER66922.2025.11259017, Mangaluru, 17-18 October 2025, pp 323-328.*

A Comparative Study on Early Detection of Parkinson's Disease using Multiple Machine Learning Algorithms

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ABSTRACT

Parkinson's Disease (PD) is a neurodegenerative condition that predominantly impacts older adults, leading to gradual challenges in movement and communication. Timely detection is essential for effective management of PD and for preserving a high quality of life. With the aging population, there is an increasing need for dependable remote detection techniques to reduce the necessity for in-person consultations for diagnosis and monitoring. This research explores the application of machine learning algorithms on vocal data to detect early-stage PD. The study involved training six machine learning models - Support Vector Machine (SVM), Random Forest, K-Nearest Neighbors (KNN), Decision Tree, Naive Bayes, and Logistic Regression and XG Boost - using a dataset that includes voice recordings from both healthy subjects and individuals with PD. The performance of the models was assessed based on their accuracy. Among these models, Random Forest, SVM, and KNN demonstrated the best performance, achieving an accuracy rate of 96.6%. This method presents a practical and economical solution for early intervention. By leveraging the strong predictive power of Random Forest, SVM, and KNN, the system can facilitate accessible and reliable screening, greatly improving the capacity to monitor the progression of PD without the necessity for frequent clinical appointments.

**Full paper: Proceedings of the International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER), DOI: https://10.1109/DISCOVER66922.2025.11258907, Mangaluru, 17-18 October 2025, pp 272-276.*

Benchmarking YOLO and Detectron2 Pre-trained Models for Helmet and License Plate Recognition: A Comparative Study

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ABSTRACT

Road safety remains a critical concern, mainly in regions of high-two wheeler density, where helmet non-compliance plays a major factor in fatal accidents. Due to the inefficiency of traditional traffic monitoring systems, sophisticated deep learning models are now required for real-time license plate recognition and helmet detection. This study explores the effectiveness of different YOLO-based architectures (YOLOv8–YOLOv12) compared to Faster R-CNN models for detecting helmets and license plates in real-world traffic scenarios. Using a custom dataset with three key classes—helmet, no helmet, and license plate—we evaluated these models based on essential performance metrics like mAP, precision, recall, and F1-score. The results clearly show that YOLO models outperform Faster R-CNN, with YOLOv9 and YOLOv12 standing out by achieving the highest mAP50-95 of 54.3% and the best balance between precision and recall. Overall, YOLO-based models demonstrated over 50% higher detection accuracy, making them a more reliable choice for real-time traffic monitoring and enforcement.

**Full paper: Proceedings of the International Conference on Intelligent Systems and Pioneering Innovations in Robotics and Electric Mobility (INSPIRE), DOI: https://10.1109/INSPIRE67328.2025.11300581, Mangaluru, 20-21 November 2025, pp 29-34.*

Smart Farming Assistant for Crop Advice and Disease Detection

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ABSTRACT

Agriculture remains the primary livelihood for millions in developing regions, yet smallholder and urban farmers continue to face persistent challenges such as low crop productivity, inefficient resource utilization, and limited access to modern agricultural technologies. This paper presents the Smart Farming Assistant, an integrated and cost-effective platform that leverages the Internet of Things (IoT) and Artificial Intelligence (AI) to enable data-driven decisionmaking in agriculture. The system collects real-time environmental data such as soil moisture, temperature, and humidity using IoT sensors, and applies machine learning models to deliver personalized crop and fertilizer recommendations. It also supports early plant disease detection through image analysis powered by deep learning. Designed with a focus on affordability, accessibility, and ease of use, the assistant empowers small-scale farmers to improve yield, optimize inputs, and adopt sustainable farming practices. This study details the system's architecture, implementation, experimental results, and outlines future enhancements to improve scalability and functionality.

**Full paper: Proceedings of the International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER), DOI: https:// 10.1109/DISCOVER66922.2025.11259034, Mangaluru, 17-18 October 2025, pp 207-212.*

MediScan Pro: Ensuring Medication Information Safety with QR Codes

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ABSTRACT

Patient safety depends on medication management, but current packaging frequently makes mistakes like forgetting medication names or expiration dates, which can result in overdosing and drug use that has expired. In order to solve this, MediScan Pro embeds QR codes on each tablet, guaranteeing constant access to crucial data. MediScan Pro circumvents the drawbacks of conventional labelling, which is vulnerable to deterioration and misunderstanding, by directly integrating QR codes onto tablets. Reliability is increased because other QR codes stay intact even if one is lost. A smartphone app that reads and decodes QR codes to show dosage, expiration dates, and drug interactions is part of the system. Experimental tests confirmed its effectiveness, and additional features like dosage reminders, refill alerts, and interaction warnings further improve adherence. Future developments could integrate the system with electronic health records (EHR) for real-time monitoring and personalized medication plans. Expanding into predictive analytics for adherence and patient behavior could further enhance healthcare outcomes.

**Full paper: Proceedings of International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER), , DOI:https:// 10.1109/DISCOVER66922.2025.11259030, Mangaluru,17-18 October 2025, pp 365-370.*

Pediatric Bone Age Assessment and Growth Analysis through Deep Learning Techniques

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ABSTRACT

Bone age assessment plays a important role in pediatrics and endocrinology, aiding in the diagnosis and management of growth disorders. Traditional methods rely on manual evaluation, which is subjective and time-consuming. Advancements in medical imaging provide opportunities for automated, reliable age prediction models. This research aims to enhance bone age assessment through X-ray imaging by integrating deep learning techniques for age prediction, bone growth stage classification, and bone density estimation. The proposed methodology involves preprocessing X-ray images, designing a neural network model to extract relevant bone structure features, and training the model for multi-task learning. Comparative experiments with traditional assessment techniques will be conducted to evaluate prediction accuracy, growth plate classification efficiency, and bone density estimation reliability. The expected outcome is a robust, data-driven solution that enhances precision, consistency, and processing speed in bone health assessment.

**Full paper: Proceedings of the International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER), DOI: 10.1109/DISCOVER66922.2025.11258948, Mangalore, 17-18 October 2025, pp 312-317.*

Advanced BI-RADS Classification for Mammographic DICOM Data using Transformers Architecture for Cancer Detection

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ABSTRACT

Breast cancer remains one of the most prevalent cancers among women worldwide, underscoring the critical need for early and accurate detection methods. The Breast Imaging Reporting and Data System (BI-RADS) is widely used by radiologists to categorize mammographic findings and estimate the likelihood of malignancy. However, mammogram interpretation can be subjective and susceptible to human error, leading to inconsistencies in diagnosis. The proposed work aims to address these limitations by developing an AI-based diagnostic system leveraging transformer architecture to classify mammographic images into BI-RADS categories with high precision. The proposed transformer-based model is designed to accurately predict BI-RADS scores, offering an automated and objective assessment to support radiologists in early breast cancer detection. It also helps in reducing diagnostic workload and supporting timely intervention, ultimately contributing to better patient outcomes. The model achieved an overall classification accuracy of 75% across three BI-RADS classes. The anticipated results of the work are enhanced diagnostic consistency and improved efficiency in breast cancer screening, setting a foundation for further advancements in AI-driven medical imaging analysis.

**Full paper: Proceedings of the International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER), DOI: 10.1109/DISCOVER66922.2025.11259008, Mangalore, 17-18 October 2025, pp 381-386.*

Advanced Lane Detection and Curvature Estimation for Autonomous Vehicles

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ABSTRACT

The rapid growth of car ownership has increased the need for effective safety mechanisms, with unintended lane departure identified as a critical contributor to road accidents. This paper presents an advanced lane detection and curvature estimation framework designed for integration into Advanced Driver Assistance Systems (ADAS) and autonomous vehicles. The approach combines camera calibration, inverse perspective transformation, color and gradient thresholding, sliding window search, and polynomial curve fitting to achieve reliable lane boundary identification and curvature estimation. Experimental evaluation shows that the proposed framework achieves improved detection accuracy and computational efficiency, making it suitable for real-time implementation in intelligent driving systems. Despite these advancements, certain challenges persist, including reduced performance in adverse weather, low-light conditions, and scenarios with significant occlusion. To address these issues, future work will explore multimodal sensor fusion using LiDAR, GPS, and digital maps, as well as deep learning–based models to enhance robustness and adaptability. The real-world applicability of this research lies in its ability to support ADAS features such as lane departure warning and automated steering assistance, thereby improving driver safety and reducing accident risk. Overall, the study contributes toward the development of intelligent, safe, and sustainable transportation systems.

**Full paper: Proceedings of the Seventh International Conference on Innovative Data Communication Technologies and Application (ICIDCA), DOI: 10.1109/ICIDCA66325.2025.11280393, Coimbatore, 06-08 October 2025, pp 105-111.*

INTELLIGENT COMPUTING & BUSINESS SYSTEMS

WeakSegNet: Combining Unsupervised Few-Shot and Weakly Supervised methods for the Semantic Segmentation of Low-Magnification Effusion Cytology Images

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ABSTRACT

Effusion cytology analysis can be time consuming for cytopathologists, but the burden can be reduced through automatic malignancy detection. The main challenge in the automation process is pixel-wise labeling. We proposed WeakSegNet, a new model that addresses the challenge of semantic segmentation in low-magnification images by utilizing only four images with pixel-wise labels. WeakSegNet combines unsupervised, few-shot, and weakly supervised learning methods. In the first stage, an unsupervised model, DeepClusterSeg, learns the homogeneous structures from different images. The few-shot method uses only four images with pixel-wise labels to map homogeneous structures to the required classes. The final stage utilized image-level labels to predict precise classes using weakly supervised learning. We conducted our experiments using a dataset from KMC Hospital, MAHE, which consisted of 345 images. We performed 5-fold cross-validation to evaluate the results. Our proposed model achieved promising results, with an F-score of 0.85 and an IoU of 0.81 for the malignant class, surpassing the performance of the standard k-means algorithm with weakly supervised learning (F-scores of 0.65 and an IoU of 0.61). The semantic segmentation of low-magnification images using our approach eliminated 47% of the sub-regions that need to be scanned at high magnification. This innovative approach reduces the workload of cytopathologists and maintains a high accuracy in effusion cytology malignancy detection.

**Full Paper*: *IEEE Access, DOI: 10.1109/ACCESS.2025.3598953, Vol 13, 2025, pp 144467-144478.*

From Hallucination to Harm: Unintended Ethical Risks in Large Language Models

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ABSTRACT

The accelerated progress of large language models like GPT-4, Claude, and LLaMA has changed the way natural language processing is done, with machines producing human-like language with uncanny fluency. With that capability comes enormous ethical problems—most notably the hallucination effect, where models create plausible but factually inaccurate or deceptive content. This paper examines the path from harmless hallucinations to concrete harms in everyday contexts, such as spreading misinformation, medical misadvice, legal abuse, and affirming toxic biases. We discuss how these unwanted outputs arise from training materials, model design, and inadequate guardrails, and measure their disproportionate effect on marginalized groups. With a cross-disciplinary approach integrating AI ethics, human-computer interaction, and cognitive psychology, we contend that LLMs not only mirror but reinforce epistemic uncertainties. We also critique current mitigation tactics such as content filtering, prompt engineering, and model fine-tuning and demand the creation of resilient ethical frameworks, transparency norms, and user accountability echanisms. This research highlights the pressing need for more responsible AI development to avoid the leap from hallucination to harm in progressively high-stakes domains.

**Full Paper: International Journal of Multidisciplinary Educational Research, Vol 14, Issue No. 8(4), 2025, pp 69-106.*

IOT Enabled Smart Bin Network

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ABSTRACT

This project presents the design and implementation of an IoT-enabled Smart Bin Network to address the challenges of inefficient urban waste collection and overflowing public garbage bins. The system uses ultrasonic sensors connected to ESP8266 NodeMCU microcontrollers to continuously measure the fill levels of waste bins. These measurements are sent in real time over Wi-Fi to a Firebase Realtime Database, where they are stored and updated dynamically. A web-based dashboard retrieves this data and displays the locations and statuses of all monitored bins on a Google Maps interface, using color-coded markers to indicate fill levels and alert authorities to bins that need urgent collection. By providing real-time visibility into waste levels across the city, this system enables municipal waste management teams to plan optimized collection routes, reduce unnecessary trips, save fuel costs, and prevent unsanitary overflowing bins. The project emphasizes a low-cost, scalable design using easily available hardware and free-tier cloud services, making it accessible for deployment even in smaller towns and cities. Future extensions could include GSM/LoRa connectivity for remote areas, predictive analytics to forecast fill levels, automated route optimization for collection trucks, and integration with citizen mobile apps to support smarter, cleaner, and more sustainable urban living.

**Full Paper: International Journal of Creative Research Thoughts, Vol 13, Issue No. 7, 2025, pp 293-303.*

Blockchain for Sustainable Supply Chains: Ensuring Transparency and Accountability in SDG 12

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ABSTRACT

Global supply chains are becoming highly complicated and bogged down by inefficiency, fraud, and a lack of transparency, which dilute the efforts towards sustainability. Blockchain technology has been put forward as a decentralized, tamper-evident answer to improve traceability and accountability throughout supply chains. This paper explores the potential of blockchain to aid Sustainable Development Goal 12 (SDG 12) – Responsible Consumption and Production. Using a survey of current blockchain supply chain platforms across sectors like agriculture, fashion, and energy, the research delineates how distributed ledgers enhance trust, minimize wastage, and facilitate ethical sourcing. We also present solutions to issues of scalability, interoperability, and the excessive energy consumption of blockchain systems. The paper suggests an integrated "Green Blockchain Framework" that incorporates renewable-powered consensus protocols with IoT sensors for real-time monitoring. Through the integration of sustainability in digital infrastructure, blockchain becomes an enabler of open, resilient, and sustainable supply chain management

**Full Paper: International Journal of Novel Research and Development, Vol 10, Issue No. 9, 2025, pp 296-307.*

VisitTrack: Face Analytics for Retail Stores

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ABSTRACT

Retail businesses face ongoing challenges in understanding customer behavior to enhance in-store experiences and drive sales. Traditional methods of customer analytics, such as surveys or manual observation, are time- consuming and lack real-time insights. VisitTrack: Face Analytics for Retail Stores addresses this gap by leveraging advanced facial recognition and sentiment analysis technologies. This system captures real-time video streams from in-store cameras to analyze customer demographics, monitor foot traffic patterns, and assess emotional responses. By employing facial recognition, VisitTrack can accurately count unique visitors, identify age and gender distributions, and detect repeat customers without compromising privacy. Sentiment analysis algorithms monitor customers' emotional states, providing valuable insights into their satisfaction levels during their shopping journey. The data empowers retailers to optimize store layouts, personalize marketing strategies, and improve customer engagement. VisitTrack supports the generation of comprehensive reports, enabling data-driven decisions while maintaining robust anonymization techniques and compliance with GDPR. This paper demonstrates the potential of AI and computer vision to revolutionize retail analytics, empowering retailers to enhance customer experiences, increase operational efficiency, and drive sales growth in an increasingly digital marketplace.

*Full Paper: International Journal of Science and Research, DOI: https://dx.doi.org/10.21275/SR251025092142, Vol 14, Issue No. 10, 2025, pp 1380-1389.

Comparative Analysis of Structural Similarity Index Measure (SSIM) and Oriented Fast and Rotated Brief (ORB) Algorithm for Detecting Fake Currency

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ABSTRACT

The Fake Note Detection Project aims to evaluate and improve upon existing methods used to identify counterfeit currency. Current techniques for fake note detection include ultraviolet (UV) light analysis, magnetic ink detection, watermark verification, and microprint assessment, each with varying levels of accuracy and reliability. While these methods are widely used, they often require specialized equipment and can be time-consuming. This project reviews these existing techniques and proposes an integrated approach that combines traditional methods with modern advancements like machine learning and image processing. By utilizing regions of interest, edge detection algorithms, and feature extraction methods, we aim to improve the accuracy and efficiency of fake note detection systems. This work not only highlights the strengths and limitations of current techniques but also explores how newer technologies can enhance the detection process, ensuring a more secure and reliable system for identifying counterfeit currency.

**Full Paper: Third International Conference on Knowledge Engineering and Communication Systems (ICKECS), DOI: 10.1109/ICKECS65700.2025.11035197, Chickballapur, 28-29 April 2025.*

Accurate Oil Spill Detection in Ocean Waters using Remote Sensing Imagery

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ABSTRACT

Oil spills in marine environments, whether accidental or intentional, have catastrophic ecological and economic consequences. Traditional oil spill detection methods, such as manual surveys and visual inspections, are labor intensive, error prone, and lack scalability to monitor large oceanic regions. With advancements in satellite remote sensing, particularly Synthetic Aperture Radar (SAR) imagery, automated detection methods using deep learning have shown promising results. This study presents an oil spill detection system leveraging SAR images and deep learning techniques, including UNet for segmentation and classification. The proposed system enhances accuracy by distinguishing oil spills from look-alike phenomena such as algae blooms, wind slicks, and calm seas. The model is trained on a labeled dataset and evaluated using key performance metrics such as precision, recall, and Intersection over Union (IoU). Experimental results indicate that the system achieves high segmentation accuracy, with an IoU of 61.90 percent at optimal training conditions. The findings suggest that integrating deep learning models with remote sensing data offers a scalable and efficient solution for real-time oil spill monitoring, reducing environmental and economic impacts.

Full paper:Proceedings of the IEEE International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics, DOI:10.1109/DISCOVER66922.2025.11258935, Mangalore, 17-18 October 2025, pp 195-200.

Query Based Video Synopsis

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ABSTRACT

With the rapid expansion of surveillance systems, managing and analyzing large volumes of recorded video footage has become increasingly challenging. Traditional video recordings store continuous data streams, making it difficult for security personnel to quickly retrieve relevant information. Video synopsis techniques address this issue by generating a condensed version of the video that retains essential events while significantly reducing its duration. This paper presents an AI-driven approach to video synopsis, focusing on query-based summarization, where frames are extracted based on user-defined queries such as human presence and vehicle detection. By leveraging YOLOv5, a state-of-the-art object detection model, we efficiently identify and extract relevant frames from surveillance footage. The extracted frames form a concise yet meaningful representation of the original video, minimizing redundancy and enabling faster video review. Our methodology offers advantages such as real-time processing, enhanced detection accuracy, and reduced storage requirements. The proposed system has applications in security surveillance, forensic analysis, and intelligent monitoring, providing an efficient solution for customizable, query-driven video summarization.

*Full paper: *Proceedings of the IEEE International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics, DOI: 10.1109/DISCOVER66922.2025.11258969, Mangaluru, 17-18 October 2025, pp 201-206.*

An Intelligent ABCBNLS-based Context-Aware Credit Card Fraud Detection with User Spending Trajectory Analysis using HFMM

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ABSTRACT

Robust Credit Card Fraud Detection (CCFD) is fundamental in the context of the digital Financial Sector (FS) for averting fraudulent transactions. Nevertheless, none of the existing CCFD studies concentrated on the Category Sequence Deviation (CSD) detection and User Spending Trajectory (UST) investigation, thereby overlooking the hidden fraudulent behaviours. Therefore, a robust context-aware CCFD with UST analysis and CSD detection utilizing Adaptive Bounded Cubic Bump Neutrosophic Logic System (ABCBNLS) and Hidden Faddeeva Markov Model (HFMM) is proposed in this paper. Primarily, the user registers in the financial application, followed by digital signature creation. Then, to initiate the transaction, the registered users log in to the application. Here, the user authentication is carried out via Digital Signature Verification (DSV). Afterward, the transaction attributes are extracted; further, the extracted transaction attributes are subjected to the trained proposed CCFD model. The CCFD dataset is gathered, followed by data pre-processing, contextual feature extraction, and correlation investigation. Thereafter, the context-aware pattern is identified. Next, by utilizing HFMM, the UST analysis and CSD detection are performed. In the meantime, to examine the behavioural risk, the proposed ABCBNLS is utilized based on the contextual features. Lastly, by using the Transfer Deep Long Adaptive Hyper-Tangent Rademacher Short Term Memory (TDLAHTRSTM), the credit card fraud is detected with an accuracy of 98.99748%. Hence, the normal transactions are completed and further stored on the Blockchain (BC) through the Proof-of-Stake (PoS) protocol. Overall, the hidden fraudulent behaviours were efficiently investigated by the proposed approach with a perplexity of 1.423.

Full paper: Journal of Harbin Engineering University, Vol 46, Issue No.11, 2025, pp 161-177.

Understanding Sarcasm in Kannada-Dataset Creation Contextual Cues and Sentiment Annotation

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ABSTRACT

Sarcasm detection plays a crucial role in sentiment analysis and natural language understanding, especially in low-resource languages like Kannada. While existing models for sarcasm detection have achieved significant success in English—owing to the availability of large-scale annotated datasets and powerful language models—Kannada presents unique challenges. These include a scarcity of labeled data, rich morphological structure, and the frequent use of idiomatic and culturally nuanced expressions. This paper focuses on the data collection aspect of sarcasm detection in Kannada, outlining the strategies adopted to build a high-quality, manually annotated dataset. We outline the data sources, annotation standards, and protocols to guarantee data balance and quality across sarcastic and non-sarcastic classes. The language and technical difficulties that arose during the collection process are also highlighted in the report. The preliminary analysis of the data being collected has been presented as it lays a strong foundation for effective sarcasm detection in Kannada.

**Full paper: Proceedings of the International Conference on Intelligent Systems and Pioneering Innovations in Robotics and Electric Mobility (INSPIRE), DOI: 10.1109/INSPIRE67328.2025.11300554, Mangalore, 20-21 November 2025, pp 97-102.*

Explainable and Adversarially Evaluated CNN for Visual Phishing Detection

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ABSTRACT

Phishing websites are increasingly designed to copy legitimate interfaces with high visual accuracy. This can lead to tricking users into revealing sensitive information. Traditional defenses based on URLs or blacklists often fail against such visual mimicry. This paper presents an explainable CNN-based model for visual phishing detection, trained on a combination of Mendeley Data and a curated screenshot dataset. We use MobileNetV2 for efficient classification and apply LIME (Local Interpretable ModelAgnostic Explanations) to highlight visual elements influencing the model's decisions. To assess resilience, we evaluate the model against adversarial perturbations generated using FGSM and PGD. Our contributions include dataset curation, LIME- based interpretability, adversarial robustness evaluation, and performance comparison with baseline models.

**Full paper: Proceedings of the International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER), DOI: 10.1109/DISCOVER66922.2025.11258928, Mangalore, 17-18 October 2025, pp 104-108.*

Autoencoder Approach for Segmentation of Necrotic Tissues from Histopathology Images

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ABSTRACT

The death of cancerous tissues is known as tumor necrosis. One of the most important therapeutic decision making factors in the case of Osteosarcoma and Renal Cell Carcinoma is the amount of tumor necrosis produced by some treatment, namely neoadjuvant chemotherapy. However, there is no standard technique for quantifying and segmenting such tissues from a histopathology image. Additionally, there is a significant amount of labor/time consumption and inter and intra-observer variability in its manual segmentation. In this work, a deep learning approach is put forth that can automatically segment the necrotic component of a given image. We are employing the supervised learning method with convolutional autoencoders for the pixel-wise segmentation. The highlighted feature of this model is that it can be trained using a single gold-standard image, yielding a training accuracy of 0.8228, training loss of 0.1096, testing accuracy of 0.7258 and testing loss of 0.3240. The intersection of Union (IoU)oU) and Dice loss are the performance metrics used in this context. We captured an image of dimension 2592×1932 and it was manually annotated by the pathologist to get the ground truth using an open-source tool CVAT.ai.

**Full paper: IEEE International Conference on Contemporary Computing and Communications, DOI: 10.1109/InC465408.2025.11256328, Bangalore, 14-15 March 2025.*

Credit Card Issuing Management and Pattern based Credit Card Fraud Detection Framework using Em-Kmeans and Els-Rtprelu-Gru

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ABSTRACT

Credit Card Fraud Detection (CCFD) is used to prevent unauthorized transactions by safeguarding cardholders from financial losses. But, existing works labelled the legitimate Credit Card (CC) holders as fraud instead of finding the actual fraud, which degraded the CCFD performance. Hence, for the secured Credit Card payment processing, this framework effectively detected the actual CC fraud using Exponential Linear Scaling-based Randomly Translational Parametric ReLU-Gated Recurrent Units (ELS-RTPReLU-GRU). The proposed method begins with Entropy Mahalanobis-Kmeans (EM-KMeans) clustering of customer personal information to assess satisfaction criteria for CC issuance. For satisfied customers, the system collects and fuses customer signatures, fingerprints, and bank logo images using Exclusive OR-Lifting Wavelet Transform (XOR-LWT). The fused image is stored in the InterPlanetary File System (IPFS), which generates a hash code for future reference. After the CC issuance, the customer CC details are encrypted using Skew Tent Map-Elliptic Curve Cryptography (STM-ECC) during online transactions. These encrypted CC details undergo fraud detection using ELS-RTPReLU-GRU in the CCFD phase by analyzing the user's CC transaction patterns and extracted features. Due to irrelevant patterns, a legit user may also be flagged as fraud. In that case, the system verifies with a hashcode given to customers. If it matches, the payment process proceeds, or else the payment is declined. The proposed system attained higher fraud and non-fraud classification accuracy of 98.8048%, which outperformed the state-of-the-art works.

**Full paper: Tanz Research Journal, DOI: 10.6084/doi.25.11.12.TANZ220438, Vol 11, Issue No. 12, 2025, pp 389-415.*

CIVIL ENGINEERINMG

Leveraging Industrial Byproducts in Ternary Blended Cement for Sustainable Concrete Production: An Engineering Environmental and Economic Assessment

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ABSTRACT

This study investigates the feasibility of using ternary blended cement within a concrete mixture, including 25–55% ground granulated blast furnace slag (GGBFS) and 5–25% granite residues (GR). Additionally, 30% coal bottom ash (CBA) was considered as fine aggregate. Various tests were conducted, including workability, compressive strength, split tensile strength, flexural strength, ultrasonic pulse velocity (UPV), rapid chloride penetration tests (RCPT) and microstructural analysis. Results showed an 11% and 18% reduction in workability for both binary and ternary blended concrete mixtures, respectively. Compressive strength initially decreased at 7 d for the binary blend, the ternary blends with 35% GGBFS and up to 15% GR achieved 6% higher strength, and at 28 d, the ternary blends showed an 18% increase in compressive strength than the control mix. The blended concrete showed higher splitting tensile and flexural strengths compared to the control mix, with 9–25% and 11–27% improvements found, respectively. RCPT demonstrated reduced chloride ion penetration, exhibiting lower charge values of 800–1600 coulombs compared to 2400 coulombs of the control mix, suggesting low corrosion risk. Microstructural analyses indicated that blended samples consumed portlandite to produce additional calcium silicate hydrate gel, which enhanced the formation of hydration products, confirming true synergistic interactions.

**Full paper: European Journal of Environmental and Civil Engineering, DOI: https://doi.org/10.1080/19648189.2025.2526833, 2025, pp 3714-3745.*

Residual Compressive Strength of Sustainable Concrete Containing Spent Clay from Petroleum Waste as Fine Aggregate

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ABSTRACT

Due to a lack of resources needed to supply high-quality aggregates for concrete, as well as pollution issues stemming from some aggregate mines, there is a need to identify a clean alternative. Using recycled petroleum waste shows potential for this purpose; however, detailed research on this topic still needs to be done. The present study aims to experimentally determine the feasibility of using spent clay, a petroleum waste, as a fine aggregate in sustainable concrete. Concrete samples were prepared with 10 %, 20 %, and 30 % sand replacement percentages. Intact and thermally damaged specimens—exposed to high temperatures ranging from 200 to 800 °C—were considered for evaluation. The study assessed compressive strength loss, UPV loss, and weight loss to evaluate the effectiveness of using spent clay aggregate to mitigate thermal damage. Additionally, 10–30 % waste granite powder as a cement replacement was used. The findings revealed that including 20 % waste spent clay improved the compressive strength of intact specimens and enhanced the residual strength after exposure to high temperatures. Furthermore, the results indicated that using 10 % waste granite powder as a cement replacement offered comparable thermal resistance in concrete containing 20 % waste spent clay aggregate.

Full paper: Construction and Building Materials, DOI: https://doi.org/10.1016/j.conbuildmat.2025.141490, Vol 479, Article No. 141490, 2025, pp 1-17.

Boosting Cement Hydration with Boron Nitride Nanotubes

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ABSTRACT

In recent years, there has been a growing interest in the use of nanomaterials as additives in various industries, including cement production. Among these materials, carbon-based nanomaterials, such as graphene and graphene oxide, have been extensively studied for their potential applications in cementitious materials. However, recent research has shown that boron nitride nanotubes (BNNT) can offer superior properties compared to their carbon-based counterparts. This study compared the properties of BNNT with those of graphene and graphene oxide when used as additives in cementitious materials. The hydration process of the nanomodified cementitious composite was studied using in situ calorimetry measurements over a period of seven days, and thermogravimetric analysis (TGA), X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), nuclear magnetic resonance (NMR), and Field Emission Scanning Electron Microscopy (FESEM) over a period of 28 days. These techniques provide insights into the mechanisms of cement hydration and the impact of boron nitride nanotubes on cementitious composites. The results demonstrate that the addition of BNNT significantly reduced the induction period during cement hydration, indicating that BNNT can enhance the reactivity of cement. Furthermore, BNNT accelerate the hydration process because of their high surface area. Phase identification by XRD peaks showed that the BNNT reinforcement could regulate the microstructure of the cementitious composites. These findings suggest that BNNT has the potential to be a more effective and efficient additive in cementitious materials than graphene and graphene oxide. The use of BNNT in cement production can lead to the development of high-performance, durable, and sustainable materials for various construction applications.

Full paper: Cement and Concrete Composites, DOI: https://doi.org/10.1016/j.cemconcomp.2024.105894, Vol 157, Article No. 105894, 2025, pp 1-10.

Effect of Two-Stage Chemical Treatment on Hemp Fiber Properties and Performance in Cementitious Composites

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ABSTRACT

This study investigates the effect of a two-stage chemical treatment on hemp fiber (HF) and its performance in cementitious composites. Untreated and treated HF were incorporated into concrete mixes. The research evaluates the impact of treated HF on microstructure, mechanical properties, and durability. Results indicate that the two-stage chemical treatment significantly improves fiber–matrix bonding and enhances the overall performance of HF-reinforced concrete.

**Full paper: Materials Letters, DOI:https://doi.org/10.1016/j.matlet.2024.137901, Vol 382, Article No. 137901, 2025, pp 1-4.*

Reconstructing the Past Environmental Conditions of Southwestern India using Estuarine Sediment Core

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ABSTRACT

Geological archives can be examined via multiple proxies to uncover significant information about historical environmental changes. In comparison to single proxy approach, the use of multiple proxies can provide better resolution of the paleoenvironmental record. Thus, in the present study, to understand the paleoenvironmental conditions in the Kali coast in southwestern India, sedimentological, geochemical and isotopic (^{210}Pb, ^{137}Cs) proxies were used. The findings demonstrated that, in previous decades, the sedimentation rate varied from 0.5 to 1.0 cm/year under conditions with relatively higher hydrodynamic energy that were more common and fluctuating, allowing for larger sand particle deposition. However, in more recent years, finer particle deposition towards the surface has been observed under conditions with lower and more stable hydrodynamic energy, with a sedimentation rate of 1.87 cm/year. Additionally, the finer fractions displayed a strong correlation with the metal distribution, which was mostly governed by Fe-Mn oxides. Furthermore, it can be revealed that the environment was warm, humid, and marine-like between 1995 and 2000 based on chemical weathering intensity values and Rb/K ratios. A subtle shift to a freshwater habitat with relatively less warm, less humid climate occurred between 2000 and 2020. Therefore, similar research with longer depositional histories coupled with multiple proxies can help predict the future climatic shifts in decadal time scales.

**Full paper: Environmental Chemistry and Ecotoxicology, DOI: https://doi.org/10.1016/j.enceco.2024.09.003, Vol 7, 2025, pp 1-9.*

Optimizing Nutmeg Shell Biochar Production Temperature for Enhanced Cement Composite Performance

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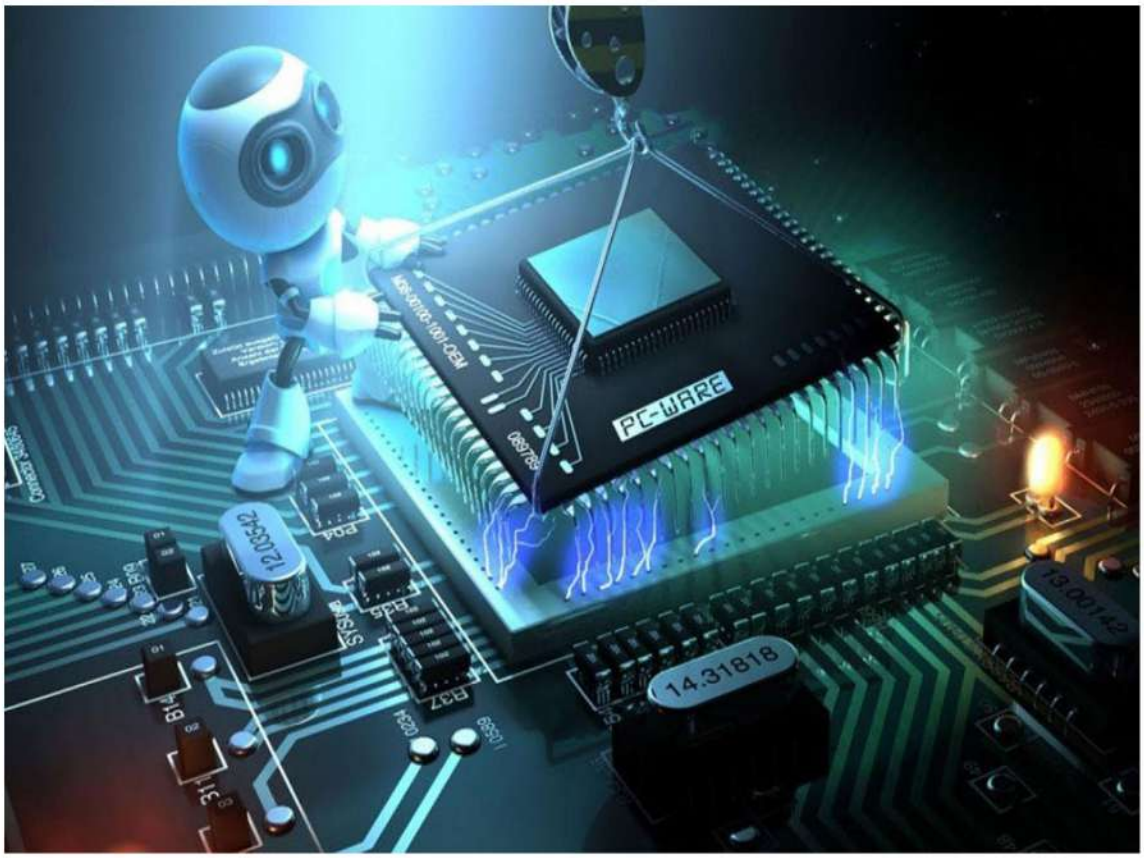
ABSTRACT

The growing focus on sustainability has driven research into converting agricultural waste into biochar (BC) for concrete applications. As cement manufacturing contributes significantly to global CO_2 emissions, BC offers a promising replacement solution. This study investigates nutmeg shell BC as a sustainable cement alternative produced through pyrolysis at temperatures of 400 °C, 500 °C, and 600 °C, and incorporates it at concentrations of 1%, 2%, and 3% by weight. The main findings reveal that 2% BC prepared at 500 °C achieved optimal performance, with 23% and 27.57% increase in compressive strength and electrical resistivity, respectively, at 28 days. Additional benefits included enhanced water absorption resistance, reduced chloride permeability. Hydration analysis confirms BC's porous structure provides nucleation sites for cluster formation during early hydration, representing a novel mechanism for accelerated strength development. This research demonstrates BC as a sustainable alternative to cement, offering environmental benefits through CO_2 reduction and the valorization of agricultural waste.

**Full paper: Journal of Sustainable Cement-Based Materials, DOI: http://dx.doi.org/10.1080/21650373.2025.2588314, 2025, pp 1-25.*



ELECTRONICS AND COMMUNICATION ENGINEERING

Optimal Headlamp Adjustment for Vehicles through Slip Angle and Stiffness Analysis using Dynamic Vehicle Model

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ABSTRACT

The current research presents a novel non-linear method for optimizing headlight adjustment using vehicle dynamic modeling. The study describes the vehicle models and gives a MATLAB-based mathematical model that is used to control the headlight adjustment. The dynamic vehicle-based model employs a slip angle evaluation technique to create a state space model that accurately determines the difference between the vehicle's position and the location of the headlight. The calculation of longitudinal and lateral velocity, and the yaw rate around the Center of Gravity, is critical to the model's capacity to predict the slip angle and, thus, govern the headlight angle. The model is deduced from differential equations and governed by Newton's law of motion. Furthermore, the study examines the effect of body stiffness, which is a crucial factor to consider when cornering, and the model achieves acceptable results within the allowable stiffness range for passenger vehicles. The simulation of the model against the car body angle shows the effective adjustment of the headlamp according to the varying degree of cornering, thus assisting in headlamp adjustment to improve ride comfort, providing strong evidence for its potential to significantly improve driving safety and comfort by optimizing headlamp adjustment. The model's consideration of body stiffness also ensures that it will contribute to the improvement of steering and vehicle handling.

**Full paper: Engineered Science, DOI:10.30919/es1388, Vol 34, 2025, pp 1-12.*

MRSimEx-DSTC: A Dynamic Spanning Tree Coverage Approach for Multi-Robot Exploration and Coverage Path Planning

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ABSTRACT

This paper presents MRSimEx-DSTC, a decentralized and adaptive framework for multi-robot coverage path planning in unknown and dynamic environments. The proposed method integrates frontier-based exploration with Dynamic Spanning Tree Coverage (DSTC), allowing each robot to incrementally map the environment while dynamically replanning its coverage path in response to both static and moving obstacles detected via onboard LiDAR. To enable decentralized execution and prevent task redundancy, the workspace is partitioned using Manhattan-distance-based Voronoi decomposition, ensuring disjoint task allocation and collision-free parallel operation without centralized coordination. The framework is validated through simulations in Python and Gazebo across varying obstacle densities and robot–obstacle speed scenarios. Experimental results show that MRSimEx-DSTC achieves high coverage efficiency (up to 99.5%), minimal overlap, and robust real-time adaptability. Compared to state-of-the-art methods such as MR-SimExCoverage and MAC-Planner, the proposed approach demonstrates superior performance, lower planning overhead, and greater resilience under real-world constraints.

**Full paper: IEEE Access, DOI: 10.1109/ACCESS.2025.3610079, Vol 13, 2025, pp 163085-163102.*

FPGA-based Pulmonary Disease Detection using Lightweight CNN

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ABSTRACT

Artificial intelligence plays a significant yet challenging role in the automatic detection of pulmonary diseases, aiding radiologists in early diagnosis and treatment initiation. This letter presents a lightweight convolutional neural network architecture for pulmonary disease detection. The proposed model achieved an accuracy of 97.72% for lung cancer detection and 98.19% for tuberculosis–pneumonia detection, with only 1779 parameters. The field programmable gate array implementation of the proposed model outperformed earlier designs by delivering a throughput of 2109.7 inferences per second at 250 MHz. In addition, the proposed design offers better computational efficiency with minimal power consumption and optimized resource utilization.

Full paper: IEEE Sensors Letters, DOI: 10.1109/LSENS.2025.3604581, Vol 9, Issue No. 10, 2025.

Security and Privacy Issues in Drone-Enabled IoT Networks

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ABSTRACT

Even though there are many prospects for the Internet of Things (IoT) and drone technology integration across different industries, there are also many security and privacy concerns. The topics of data interception, unauthorized access, data breaches, physical security, and defenses against denial-of-service (DoS) assaults are examined in this article. It also covers the usage of machine learning in the identification of malicious activity. Investors may ensure safer and more efficient operations by enhancing the privacy and integrity of drone-enabled IoT networks by implementing strong security standards and utilizing cutting-edge technologies. Data that has been encrypted will only be accessible to the owner; without the required level of permissions, others will not be able to interfere and misuse the data.

**Full paper: Machine Learning for Drone-Enabled IoT Networks, Advances in Science, Technology & Innovation, DOI: 10.1007/978-3-031-80961-3_4, Springer,2025, pp 65-80.*

SAHAY- Library Assistant Bot

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ABSTRACT

In the evolving landscape of smart technologies, the integration of intelligent assistant bots into libraries can significantly enhance user experience, automate services, and provide personalized interaction. This paper presents the development and deployment of "SAHAY," a Smart Assistant Bot designed for use in academic libraries. SAHAY integrates face recognition, speech recognition, motor control, and autonomous navigation to interact with users, provide book search, retrieval assistance, and manage user queries. The project aims to create a cost-effective, scalable, and user-friendly assistant for improving library services in educational institutions.

**Full paper: International Journal of Research and Analytical Reviews, DOI: http://www.ijrar.org/IJRAR1EFP006.pdf, Vol 12, Issue No. 3, 2025, pp 33-38.*

Eco Sethu: Smart Routing for Efficient Waste Management Systems

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ABSTRACT

Rapid growth of urbanization has led to vast amount of waste generation, making it quite challenging to collect and dispose them efficiently. Traditional waste management methods rely on fixed schedules, which often lead to problems such as increase in operational costs, fuel consumption and environmental effects. This article presents Eco Sethu, a dynamic waste management system that uses various machine learning techniques and route optimization algorithm for efficient waste collection. In particular, the model initially predicts the household waste generated using the collected historical data and various performance metrics. Among all the other models, Random Forest model showed better performance with higher accuracy. These predictions were used as the input to the route optimization algorithm model, which is solved using the Traveling Salesman Problem and Nearest Neighbour Approach. This helps in reducing the travel distances and use the truck's capacity effectively. Additionally, a web application is also developed using Fast API and SQLite, providing real-time collection schedules, issue reporting, and waste segregation practices to increase community participation.

**Full paper: Journal of Emerging Technologies and Innovative Research, DOI: http://www.jetir.org/papers/JETIRGW06023.pdf, Vol 12, Issue No. 6, 2025, pp 134-142.*

Dynamic Spanning Tree Coverage with Q-Learning: A Hybrid Framework for Efficient Robot Navigation in Environments with Moving Obstacles

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ABSTRACT

This paper presents a novel hybrid framework that combines Dynamic Spanning Tree Coverage (D-STC) with Q-learning to address the challenges of mobile robot navigation and coverage in dynamic environments. The proposed method enables efficient exploration and complete area coverage while actively avoiding both static and moving obstacles using LIDAR-based real-time sensing and adaptive path planning. To evaluate robustness under varying levels of environmental dynamics, simulations were conducted in three obstacle speed scenarios: 1) obstacles slower than the robot, 2) equal-speed obstacles, and 3) faster obstacles. While D-STC provides structured traversal and Q-learning offers real-time adaptability, their integration significantly improves overall performance. In a 10 × 10 grid, the hybrid method required only 104, 109, and 114 steps across the respective scenarios, achieving the highest coverage efficiencies (99.0%, 97.0%, and 94.5%) and the lowest overlap rates (4.81%, 11.01%, and 17.11%). These results demonstrate that the proposed hybrid approach effectively reduces redundant traversal, enhances path efficiency, and dynamically responds to changing obstacle configurations—making it highly suitable for real-world, unpredictable, and obstacle-dense environments.

**Full paper: IEEE Access, DOI: 10.1109/ACCESS.2025.3602149, Vol 13, 2025, pp 149121-149141.*

Sensor Fusion and Predictive Control for Adaptive Vehicle Headlamp Alignment: A Comparative Analysis

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ABSTRACT

Nighttime driving safety is often compromised by the inability of conventional adaptive headlamp systems to account for lateral slip and rapidly changing road conditions, leading to misalignment and reduced visibility during aggressive maneuvers. Most existing approaches rely solely on steering angle, which limits adaptability under dynamic slip scenarios. This study presents the development and comparative evaluation of a Fused Controller that uniquely integrates sensor fusion, adaptive gain scheduling, and multi-step predictive optimization for robust adaptive headlamp alignment. Five control architectures- Filtered Proportional Controller (FPC), Raw State MPC (RS-MPC), Extended MPC (E-MPC), Feedforward-Enhanced MPC (FF-MPC), and the proposed Fused Controller- were systematically evaluated on a 2 km synthetic road with ten challenging segments. Compared to the E-MPC baseline, the Fused Controller achieved a 42.5% reduction in root mean square error (RMSE) in long S-curves and a 30.6% improvement in sharp turns, with a settling time of 0.6 s (versus 1.8 s for FPC) and a jitter index of 9.93°/s. Frequency-domain analysis confirmed a 1.2 Hz bandwidth with actuator-compatible roll-off, and stability analysis validated robustness under noise and disturbances. Statistical analysis across 20 independent simulation runs per controller showed these improvements are highly significant ($p < 0.001$, large Cohen's d), confirming the practical superiority of the Fused Controller. These results indicate enhanced driver visibility and reduced nighttime collision risk, while the controller's computational efficiency and adaptive gains support scalability and real-world deployment. This work provides a rigorous and practical framework for next-generation adaptive lighting systems.

**Full paper: Journal of Robotics and Control, DOI: 10.18196/jrc.v6i5.267402166, Vol 6, Issue No. 5, 2025, pp 2166-2183.*

GSM-Based Smart Glove for Gesture Recognition and Health Monitoring in Paralysis Patients

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ABSTRACT

Paralysis severely impairs communication and mobility, necessitating effective assistive technologies to support patient care. GSM-based smart glove system that integrates gesture recognition, real-time health monitoring, and fall detection into a wearable solution for disabled person. The system employs flex sensors to capture finger movements, a gyroscope (MPU6050) to detect falls, and the MAX30100 sensor for heart rate monitoring. Sensor data is continuously processed by an Arduino- based microcontroller, which maps specific gesture patterns to predefined commands and initiates voice and SMS alerts via a GSM module (SIM800L). This implementation demonstrates a low-cost, modular, and testable solution that enhances patient communication, safety, and remote health monitoring using wireless communication.

Full paper: International Conference on Biomedical Engineering and Sustainable Healthcare, DOI: 10.1109/ICBMESH66209.2025.11182196, Manipal, 08-09 August 2025.

Deep Learning-Assisted UAV Inspection for Structural Crack Detection in Confined Marine Tank Environments

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ABSTRACT

Structural health monitoring is vital to ensure the safety and integrity of marine tanks, which are extensively used in the maritime, oil, and chemical industries. Traditional inspection methods are often manual, time-consuming and hazardous, especially in confined or inaccessible environments. This paper presents the design and development of a UAV-based autonomous inspection system for detecting cracks inside marine tank interiors, offering a safer and more efficient alternative. The approach begins with a MATLAB-based simulation where UAVs navigate and inspect three-dimensional models of cuboidal, cylindrical, and horizontal cylindrical tanks, ensuring full surface coverage through systematic path planning. Crack detection is simulated using proximity-based logic with real-time visual indicators. In the second phase, a practical implementation using Python and OpenCV is introduced, where a webcam-based system captures live images, applies a deep learning model, and measures the pixel length of detected cracks. The combined simulation and implementation demonstrate accurate crack detection and UAV navigation, validating the system's potential for real-world deployment. Tools utilized include MATLAB R2024, Python 3.11, OpenCV, TensorFlow, and Keras.

**Full paper: Proceedings of the Twelth International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions), (ICRITO), DOI: 10.1109/ICRITO66076.2025.11241870, Noida, 18-19 September 2025, pp 1-6.*

Enhanced Driving Safety: Intelligent Lighting Systems for Fog and Beam Management

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ABSTRACT

Nighttime driving, though accounting for just 25% of total travel, causes 55% of road accidents due to poor lighting on curves and glare from oncoming vehicles. Traditional headlamps often fail to address these challenges. To improve safety, a multi-sensor adaptive lighting system is proposed for city and highway use. It automatically adjusts between high and low beams based on ambient light and vehicle proximity, enhancing visibility in low-light, foggy, and rainy conditions. The system includes a simple control interface for easy vehicle integration and improves steering visibility while reducing blind spot-related accidents. Equipped with rain and fog sensors and built on the CAN protocol, it is suitable for diverse driving environments, especially in India. Future enhancements may include AI-powered lighting adjustments and automated overtaking functionality using pass lights for smarter, safer driving.

**Full paper: International Conference on Vehicular Technology and Transportation Systems, DOI: 10.1109/ICVTTS67119.2025.11296540, Bangalore, 19-20 September 2025.*

Enhancing Optical Network Performance during Failures: Value Proposition from Dense Wavelength Division Multiplexing

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ABSTRACT

The advancement of optical networks as the backbone of modern telecommunications has been enhanced by their high data capacity, minimal latency, and adaptability. Fiber optic technology is essential for sending large volumes of data over extensive distances, serving applications include video streaming, cloud computing, and gaming on the internet.Ensuring network survivability, defined as the ability to endure disruptions from natural or physical disasters, is essential. Fiber cable cuts are a common type of network failure, requiring efficient traffic restoration methods to ensure service continuity. Restoration solutions, divided into facility repair and facility restoration, entail trade-offs between flexibility and capacity needs, affecting their efficiency. In this context, cross-layer analytics which integrates the physical layer and data link layer of optical network are vital for improving network resilience. Dense Wavelength Division Multiplexing (DWDM) is a crucial innovation in optical communication that provides substantial benefits in capacity, distance, and spectral efficiency, rendering it essential in the core networks of telecommunication systems. This study is proposed to examine fixed and variable backup path techniques to enhance signalredirection during connection breakdowns. A comparative examination with existing methods, such as Kruskal and Hamiltonian algorithms, illustrates the effectiveness of the proposed strategy. The results enhance restoration procedures in optical networks, responding to the increasing need for dependable and high-capacity telecommunications infrastructure. The study has taken in to account secondary data concerned with capital expenditure (CAPEX) and operational expenditure (OPEX), where in network operatorscan determine the most cost-effective solutions while maintaining optimal network performance. It was identified that the DWDM offers a compelling value proposition in terms of cost-efficiency, scalability, and long-term operational savings.

Full paper: Journal of Information Systems Engineering and Management, DOI: https://doi.org/10.52783/jisem.v10i42s.8392, Vol. 10, Issue No. 42s, 2025, pp 1164-1178.

Adaptive Spanning Tree-Based Coverage Path Planning for Autonomous Mobile Robots in Dynamic Environments

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ABSTRACT

In this study, a unique approach is presented to improve autonomous robots' path planning abilities, especially in dynamic environments. We propose a Dynamic Spanning Tree Coverage (D-STC) algorithm designed to handle both stationary and moving obstacles using a depth-first search (DFS) methodology. The workspace is partitioned into cells, and a spanning tree guides the robot's motion to ensure full coverage while dynamically avoiding obstacles detected using onboard LIDAR sensors. The effectiveness of D-STC was evaluated across three dynamic scenarios based on relative speeds of the robot and obstacles. Simulation results show that the proposed method achieves a coverage efficiency of up to 98.25% when the robot is faster, with a minimal overlap rate of 3.06% and only 412 steps required to cover a workspace of 20×20 grid. Even in more challenging scenarios with faster-moving obstacles, D-STC maintains robust performance with 96.52% coverage and 11.2% overlap. These results demonstrate that the proposed approach significantly enhances coverage quality, reduces redundancy, and adapts effectively to dynamic environments, making it suitable for real-world applications such as surveillance, cleaning, and agricultural robotics.

**Full paper: IEEE Access, DOI: 10.1109/ACCESS.2025.3578338, Vol 13, 2025, pp 102931-102950.*

Dynamic Coverage Path Planning for Mobile Robots: A Spanning Tree based Approach with Real-Time Obstacle Avoidance

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ABSTRACT

This paper presents a novel dynamic Coverage Path Planning (CPP) algorithm for mobile robots operating in grid-based workspaces, with an emphasis on real-time obstacle avoidance. The environment is partitioned into major nodes and subcells to facilitate efficient area coverage using a spanning tree-based strategy. The robot, equipped with 360-degree LiDAR sensors, continuously scans its surroundings to detect both static and dynamic obstacles within a predefined range. Dynamic obstacles, assumed to move at the same speed as the robot, are managed through predictive redirection mechanisms. Specifically, the robot adapts its trajectory based on the obstacle's direction of motion—rerouting vertically in response to horizontally moving obstacles and horizontally in response to vertically moving ones. This adaptive strategy ensures complete coverage while minimizing the risk of collisions. Simulation results validate the effectiveness of the proposed algorithm in both static and dynamic scenarios, demonstrating superior performance in coverage efficiency and real-time adaptability compared to existing methods.

**Full paper: International Conference on Advancements in Power, Communication and Intelligent Systems, DOI: 10.1109/APCI65531.2025.11137335, Kannur, 27-28 June 2025.*

High-Performance Winograd based Accelerator Architecture for Convolutional Neural Network

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ABSTRACT

Convolutional Neural Networks are deployed mostly on GPUs or CPUs. However, due to the increasing complexity of architecture and growing performance requirements, these platforms may not be suitable for deploying inference engines. ASIC and FPGA implementations are appearing as superior alternatives to software-based solutions for achieving the required performance. In this article, an efficient architecture for accelerating convolution using the Winograd transform is proposed and implemented on FPGA. The proposed accelerator consumes 38% less resources as compared with conventional GEMM-based implementation. Analysis results indicate that our accelerator can achieve 3.5 TOP/s, 1.28 TOP/s, and 1.42 TOP/s for VGG16, ResNet18, and MobileNetV2 CNNs, respectively, at 250 MHz. The proposed accelerator demonstrates the best energy efficiency as compared with prior arts.

**Full paper: IEEE Computer Architecture Letters, DOI: 10.1109/LCA.2025.3525970, Vol 24, Issue No. 1, 2025, pp 21-24.*

A Comprehensive Survey on Coverage Path Planning for Mobile Robots in Dynamic Environments

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ABSTRACT

Coverage Path Planning (CPP) is a fundamental aspect of mobile robotics, enabling robots to navigate dynamic environments efficiently while ensuring thorough coverage of all areas of interest and avoiding obstacles. CPP is pivotal in diverse applications, from everyday tasks like vacuum cleaning, lawn mowing, and window cleaning to specialized operations such as demining hazardous areas, autonomous underwater imaging, and inspecting complex structures. This survey reviews recent advancements in CPP, focusing on algorithms and methodologies tailored for dynamic environments. It highlights the challenges posed by environmental variability, obstacle dynamics, and real-time computational demands. By synthesizing insights from existing research, this survey aims to guide future developments in CPP, paving the way for smarter and more adaptive robotic systems capable of handling the complexities of real-world scenarios.

**Full paper: IEEE Access, DOI: 10.1109/ACCESS.2025.3556446, Vol 13, 2025, pp 60158-60185.*

Integrating Multiclass Classifiers for Enhanced Acute Lymphoblast Leukemia Detection: A Comparative Study

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ABSTRACT

Acute lymphoblastic leukemia (ALL) is a blood and bone marrow malignancy that is characterized by the growth of many immature lymphocytes known as lymphoblasts. It primarily affects children, particularly those aged two to five years, and is the primary cause of death in pediatric cancer cases. The method of treatment is determined to ALL, the individual's age at the time of diagnosis, and other pertinent considerations. Regardless, early detection and diagnosis are critical for a good prognosis. It is critical to precisely detect malignant cells to make a diagnosis and assess the extent of the disease. However, due to physical similarities, identifying lymphoblasts from normal white blood cells under a microscope is often difficult. Using computeraided techniques can be extremely valuable in automating the identification of cancerous cells, allowing histopathologists and oncologists to make decisions about the early stage. This paper demonstrates the usefulness of extensive image pre-processing, feature extraction from ResNet50 and VGG19 CNN models, and robust feature selection in an automated diagnostic technique for Acute Lymphoblastic Leukemia. Notably, on the CNMC 2019 Dataset, ResNet50 with Random Forest feature selection appears as the best combination. The ResNet50 model achieves maximal precision, Weighted F1 Score, F1-score accuracy, and recall of 84.18%, 80.4%, 86.15%, 80.83%, and 88.7% respectively when combined with ANOVA and Random Forest. The combination of VGG19+Random Forest+SVM achieves a maximum accuracy of 86.2%. These findings highlight its exceptional performance in recognizing and categorizing target labels, demonstrating its ability to extract relevant properties for improved leukemia identification.

Full paper: Yugoslav Journal of Operations Research, DOI: https://doi.org/10.2298/YJOR240315006N, Vol 35, Issue No. 4, 2025, pp 947-964.

Spectral Descriptors for the Assessment of Vocal Fold Nodules and Feature Optimisation using MRMR Algorithm

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ABSTRACT

Objective assessment of voice in vocal nodules from the spectral descriptive features is discussed in this study. Further, MATLAB feature engineering is explored to automate the process of feature engineering. The performance of a set of optimisable classifiers such as decision tree, bagged trees, Naive Bayes, linear and quadratic support vector machines was evaluated on feature engineered dataset. The decision tree outperformed all other classifers with an accuracy of 84.2% for engineered features. Spectral centroid obtained highest ranking using maximum relevance and minimum redundancy feature ranking method and found to be most appropriate for classification. Harmonic ratio, harmonic to noise ratio, shimmer variants, and spectral centroid features obtained a significant amount of correlation with the perceived degree of hoarseness. Among these features, spectral centroid is found to be strongly negatively correlated, hence can be effectively used as a quantitative indicator to measure the level of severity of the pathologic voice.

Full paper: International Journal of Intelligent Systems Technologies and Applications, DOI: https://doi.org/10.1504/IJISTA.2025.148888, Vol 23, Issue No. 3, 2025, pp 337-362.

A Comprehensive Study of Solid Waste Classification using Deep Learning and Machine Learning Techniques

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ABSTRACT

Solid Waste Management (SWM) involves the strategic planning and procedural management of solid wastes, which is a key factor in sustainable development of municipalities from physical, logical, and legal-political perspectives. Municipal Solid Waste (MSW) is typically managed using four methods: composting, recycling, landfilling, and incineration for reuse. The absence of proper on-site solid waste treatment increases the burden on urban municipalities, as the growing volume of waste demands methods such as recycling and source separation, along with classification for disposal. In mining activities, large volumes of Mining-Associated Solid wastes (MASW) are generated across various stages including exploration, separation, concentration, crushing, and sorting. Machine Learning (ML) and Deep Learning (DL) techniques have been employed in solid waste classification to categorize wastes as organic and recyclable. The conventional ML and DL techniques include Artificial Neural Network (ANN), Support Vector Regression (SVR), Convolutional Neural Network (CNN), and Graph Long Short-Term Memory (GLSTM) employed for solid waste classification. The performance metrics of accuracy, precision, recall, and F1-score are used to evaluate the models' effectiveness of ML and DL techniques in solid waste classification.

**Full paper: Proceedings of the International Conference on Artificial Intelligence and Data Engineering, DOI: 10.1109/AIDE64228.2025.10987320, Nitte, 06-07 February 2025, pp 63-66.*

Comprehensive Investigation of Channel Estimation Techniques in mmWave MIMO Systems: Unlocking the Potential of Future Connectivity

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ABSTRACT

Millimeter wave (mmWave) MIMO systems are critical for next-generation wireless communication, yet accurate channel estimation remains a key challenge due to high pilot overhead and dynamic channel conditions. This paper explores advanced channel estimation techniques, focusing on deep learning-based methods such as denoising autoencoders and supervised learning approaches. These techniques leverage spatial and temporal correlations to reduce pilot overhead while improving estimation accuracy. The study synthesizes existing literature on deep learning applications for channel estimation and highlights key trends, methodologies, and challenges. Furthermore, this review identifies research gaps, such as computational complexity in real-time applications and limitations in handling high-speed channel variations. By critically analyzing recent advancements and their limitations, this work provides insights into future research directions for enhancing mmWave MIMO channel estimation using hybrid deep learning models.

**Full paper: Third International Conference on Integrated Circuits and Communication Systems, DOI: 10.1109/ICICACS65178.2025.10967592, Raichur, 21-22 February 2025.*

Comparative Analysis of Machine Learning Models for Alzheimer's and Dementia Differentiation

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ABSTRACT

This research addresses the critical need in neurology for distinguishing Alzheimer's disease from dementia, a complicated diagnostic procedure. It conducts a thorough investigation of novel methodological approaches to improve diagnostic precision and clinical efficacy. The study evaluates Convolutional Neural Network (CNN), Recurrent Neural Network (RNN), and Long Short-Term Memory (LSTM) models, measuring their performance against crucial criteria such as Accuracy, Precision, Sensitivity, Recall, and Specificity. Statistical study indicates CNN's exceptional accuracy, putting it at the epicenter of precision-sensitive applications. While CNN and RNN have equivalent precision, they significantly exceed LSTM, particularly in terms of false positives. Additionally, CNN and RNN have higher sensitivity and recall than LSTM, demonstrating their superiority. Although the variations in specificity between CNN and RNN are not statistically significant, CNN and RNN show proficiency in lowering false negatives, which is crucial in recognizing infrequent but significant occurrences. The study underlines the critical relevance of tailoring model selection to specific application goals and inherent trade-offs. CNN emerges as the best overall choice, but both CNN and RNN outperform LSTM in precision, making CNN a viable option. Furthermore, improvements in CNN model calibration greatly improve predictive precision for subject condition predictions. The comprehensive study gives significant insights for developing diagnostic methods that are customized to the subtleties of Alzheimer's disease and dementia distinction.

**Full paper: AIP Conference Proceedings, DOI: https://doi.org/10.1063/5.0262995, Vol 3278, Issue No.1, 2025, pp 020034.*

Identifying Subtypes of Acute Lymphoblastic Leukemia using Blood Smear Images: A Hybrid Learning Approach

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ABSTRACT

Leukemia is a type of blood cancer that affects a large number of people worldwide. Detecting and classifying leukemia is crucial in determining the treatment plan for patients and improving their chances of survival. The design of a hybrid model comprising MobileNet as a feature extractor and Support vector machine algorithm to classify the leukemia cells into four classes: benign, pre-B, early pre-B, and pro-B. The confusion matrix calculates various performance metrics such as F1 score, accuracy, recall, and precision in this method. The experimental results show that the suggested model performs better than the existing stateof-the-art models for leukemia cell classification, obtaining a remarkable existing state-of-the-art model for leukemia cell classification, obtaining an accuracy in classification of 99.3%. The proposed approach can aid in the early detection of leukemia, leading to better treatment outcomes and improved patient survival rates.

**Full paper: Journal of the Institution of Engineers (India): Series B, DOI: https://doi.org/10.1007/s40031-024-01069-0, Vol 106, 2025, pp 426-436.*

Smart Reader for Blind People

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ABSTRACT

The system is dedicated to the development of an innovative smart reading table designed specifically for individuals with visual impairments. This technology aims to facilitate the reading of printed materials for people with visual challenges by integrating advanced technologies such as optical character recognition (OCR) and text-to-speech (TTS). The system is comprised of a Raspberry Pi, a 5MP camera module, a speaker, and mechanical push buttons to enhance user interaction. Despite significant advancements in existing text-tospeech conversion technologies, many users continue to depend on external computing resources or internet connectivity. This project addresses the essential need for a self-contained, costeffective, and user-friendly system that functions independently of external devices, thereby alleviating issues related to accessibility and practicality. The methodology implemented involves capturing images with the Raspberry Pi camera module, processing these images to extract text using OCR, and converting the extracted text into audible speech through offline TTS tools such as pyttsx3. A mechanical switch allows for image capture, and controls for audio playback are integrated into the system. The system offers multilingual support with Kannada and English voice output. Experimental results demonstrate 95% text extraction accuracy from clear images and an average processing time of 26.06 seconds, confirming its reliability in real-world applications. Future developments will concentrate on enhancing image processing capabilities for deburring, implementing multilingual support, optimizing hardware for improved performance, and incorporating additional features such as braille output. The technology exhibits considerable potential for implementation in educational institutions, libraries, and as personal reading aids for individuals with visual impairments.

**Full paper: International Conference in Advances in Power, Signal, and Information Technology, DOI: 10.1109/APSIT63993.2025.11086193, Bhubaneswar, 23-25 May 2025.*

Comparative Analysis of Snake and Ellipse Segmentation Methods for Breast Cancer Detection using Breast Thermograms

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ABSTRACT

Breast cancer is a leading cause of mortality among women, and early detection is crucial in improving survival rates. Computer-aided tools assist radiologists in identifying abnormalities, with breast thermography emerging as a non-invasive and radiation-free technique for early diagnosis. However, robust segmentation is essential to enhance the accuracy of AI-based detection models. This study compares Snake and Elliptical segmentation methods for breast thermogram analysis. The Snake Algorithm achieved higher accuracy with Jaccard Index of 0.78 but required more processing time, while the Ellipse Method was faster with a Jaccard Index of 0.72. Texture features extracted using GLCM revealed contrast, eating habits, and age as significant indicators in distinguishing normal and abnormal breast. A Support Vector Machine classifier trained on 100 samples with these features achieved 78% accuracy. The results highlight a trade-off between segmentation accuracy and computational efficiency, suggesting that hybrid models could optimize both performance and speed in thermographic breast cancer detection.

**Full paper: Proceedings of the First International Conference on Computer, Computation and Communication, Ooty, 28-29 March 2025 pp 306-311.*

A Comparative Study on Blocking Performance of Wavelength Routing Strategies in Optical Backbone Networks

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ABSTRACT

This study presents a comparative performance analysis of Wavelength Division Multiplexing (WDM), Coarse Wavelength Division Multiplexing (CWDM), and Dense Wavelength Division Multiplexing (DWDM) systems, focussing on their blocking probabilities across different traffic intensities. The assessment was performed on a 19 node optical backbone network topology which represents real infrastructure. Each multiplexing technique has been developed to ITU-T standards, allocating 8 wavelengths for WDM, 18 for CWDM, and 96 for DWDM. The blocking probability was examined over traffic loads from 30 to 80 Erlangs, assuming a uniform demand distribution and shortest-path wavelength routing without conversion. Simulation results indicate that DWDM substantially outperforms both CWDM and WDM by exhibiting the lowest blocking probability in all traffic scenarios, thereby validating its suitability for high-capacity and scalable transport networks. CWDM displayed modest performance owing to its larger channel spacing, but traditional WDM exhibited the highest blocking rates under growing load situations. These findings provide significant insights for the selection of wavelength routing strategies and implementation of next-generation optical backbone networks.

Full paper: Proceedings of the IEEE International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics, DOI: 10.1109/DISCOVER66922.2025.11258992, Mangalore, 17-18 October 2025, pp 524-528.

Simulation of a Battery Management System for Electric Vehicles

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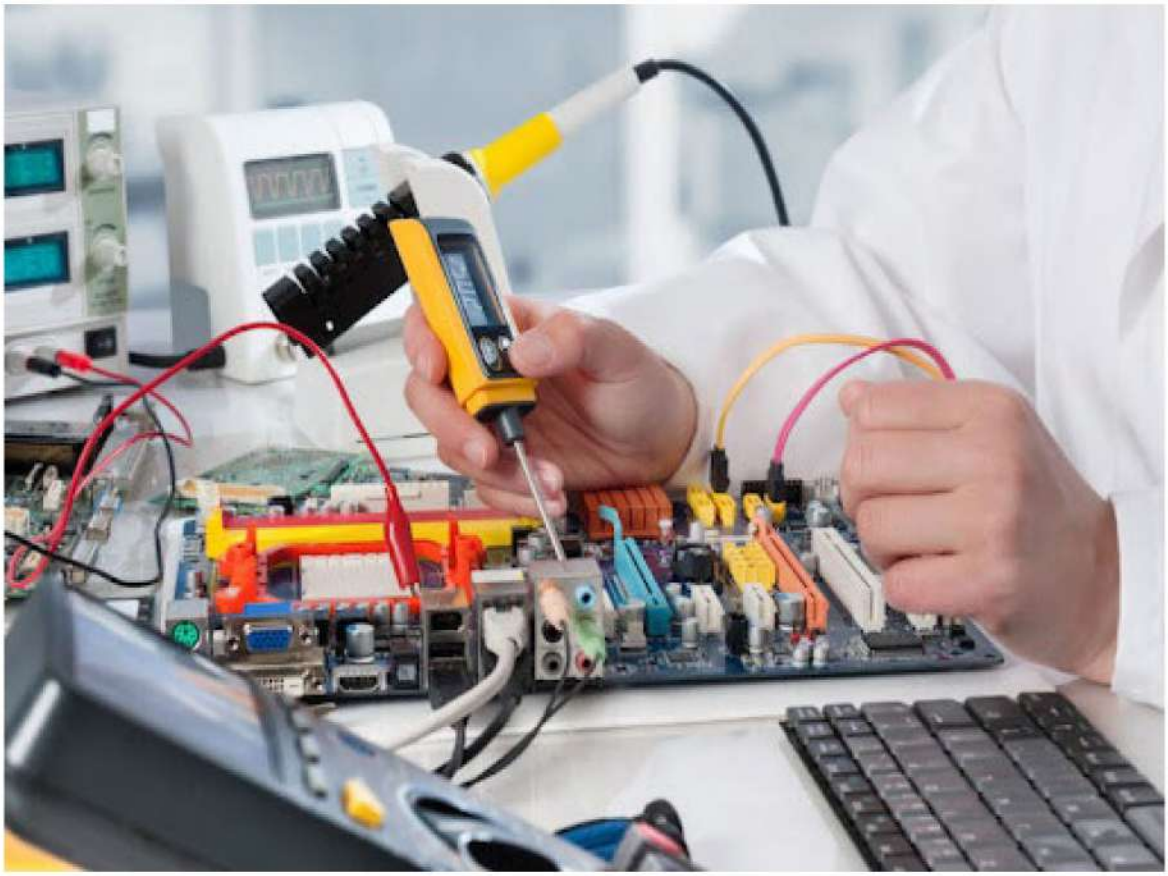
ABSTRACT

This work focuses on simulating a Battery Management System (BMS) for Electric Vehicle (EV) batteries. It models the charging and discharging processes while monitoring key parameters like State of Charge (SOC), voltage, current, and State of Health (SOH). The simulation aims to provide a practical understanding of battery performance and management. Advancements in BMS technology have significantly improved battery safety and efficiency in EVs. However, understanding battery behavior in dynamic conditions remains a challenge. This work addresses this gap by offering a realistic and interactive simulation of battery operations, providing a novel tool for studying and improving BMS functionality. The simulation uses Python to model battery parameters and algorithms, ensuring accurate updates of SOC, voltage, and SOH in real-time. It replicates charging and discharging processes under different conditions. The work includes a dynamic interface that visualizes battery performance, ensuring a clear representation of results. This simulation successfully demonstrates the behavior of a BMS during charging and discharging, offering valuable insights into battery operations. Future developments can focus on integrating this simulation with cloud-based systems for remote monitoring and fleet management.

**Full paper: Proceedings of the IEEE International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics, DOI: 10.1109/DISCOVER66922.2025.11259023, Mangalore, 17-18 October 2025, pp 730-734.*



ELECTRICAL AND ELECTRONICS ENGINEERING

UHF- RFID Inventory Control System

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ABSTRACT

This paper explores the application of Ultra-High-Frequency Radio Frequency Identification (UHF-RFID) technology for effective inventory management in retail and warehouse enterprises. The system developed presents the transition from manual handheld readers, to an advance solution featuring autonomous UHF-RFID robots. These autonomous robots, integrated with RFID systems and Raspberry Pi 4 controllers, are capable of navigating the indoor spaces, conducting inventory checks and transmitting data directly to Google Spreadsheets via HTTP webhooks. A Graphical User Interface (GUI) facilitates user control and monitoring through a 5-inch LCD display. Further, the functionality of the robot is extended to QR code scanning and motorized movement, to enable efficient inventory tracking and management. For safety measures, the system includes an emergency stop button that instantly cuts off the power in critical situations. Overall, this project streamlines inventory accuracy, reduces manual errors, and significantly enhances operational efficiency in retail and warehouse management.

**Full paper: Proceedings of International Conference on Recent Engineering and Technology, East West College of Engineering, Bangalore, 16th -17th May 2025, pp 32.*

Fault Detection of Outdoor Insulator using Digital Image Processing

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ABSTRACT

Electrical Insulators are commonly found near electrical installations and they provide safety to the operators and electrical installations which could be operating at high voltage. The failure of such insulator is unwarranted and can cause severe problems threating life and property. Manual inspection of all outdoor insulators is tedious and cumbersome since these insulators are mounted at a height of 10 – 15 feet above the ground level. Inspecting all insulation for scrapes and breaks is essential. The purpose of this paper is to facilitate early detection of the damaged insulator using Image processing technology. Good and bad insulators are classified by this technique. The study is carried out on images of the pin and disk insulators. This technology is based on a deep learning method. The CNN model used in the paper shows validation accuracy of 100% and test accuracy of 96%. This technique can be implemented for early detection of failure of electrical apparatus such as switch gear and batteries.

**Full paper: International Conference on Control Communication & Power Engineering, Bengaluru, 26-27 July 2025.*

Impact Analysis of Optimal Placed DSTATCOM with Distributed Generation Sources

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ABSTRACT

One of the devices used to enhance the distribution system's power quality is DSTATCOM. The effective operation will be impacted by their positioning and dimensions. The ACO approach is used in this study to arrange and to find the size of DSTATCOM. Power quality problems will increase as distribution generators are added to the distribution system. This paper presents the effects of DSTATCOM and distribution generators on distribution systems under various operating conditions. The system is examined under various conditions, and the outcomes show how the voltage profile improves and line losses decrease.

*Full paper: Fifth International Conference on Intelligent Technologies (CONIT), DOI: 10.1109/CONIT65521.2025.11167308, Hubbali, 20-22 June 2025.

Development of a Long-Term Solar PV Power Forecasting Model for Power System Planning

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ABSTRACT

Purpose: This paper aims to Solar photovoltaic (PV) power can significantly impact the power system because of its intermittent nature. Hence, an accurate solar PV power forecasting model is required for appropriate power system planning.

Design/methodology/approach: In this paper, a long short-term memory (LSTM)-based double deep Q-learning (DDQL) neural network (NN) is proposed for forecasting solar PV power indirectly over the long-term horizon. The past solar irradiance, temperature and wind speed are used for forecasting the solar PV power for a place using the proposed forecasting model.

Findings: The LSTM-based DDQL NN reduces over- and underestimation and avoids gradient vanishing. Thus, the proposed model improves the forecasting accuracy of solar PV power using deep learning techniques (DLTs). In addition, the proposed model requires less training time and forecasts solar PV power with improved stability.

Originality/value: The proposed model is trained and validated for several places with different climatic patterns and seasons. The proposed model is also tested for a place with a temperate climatic pattern by constructing an experimental solar PV system. The training, validation and testing results have confirmed the practicality of the proposed solar PV power forecasting model using LSTM-based DDQL NN.

**Full paper: World Journal of Engineering, DOI: https://doi.org/10.1108/WJE-09-2023-0407, Vol 22, Issue No. 2, 2025, pp 250-259.*

MECHANICAL ENGINEERING

Advancements in Thermal Barrier Coatings for Internal Combustion (IC) Engines

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ABSTRACT

Pistons of diesel engines are made of aluminum alloys. There has always been a need to increase the thermal efficiency of engines which use these pistons. Aluminum Alloy pistons find their application because they are lightweight and have a comparatively good heat transfer ability and strength to weight ratio. However, aluminum alloys exhibit increased coefficient of thermal expansion, low durability at high temperatures, increased wear rates and formation of aluminum oxide due to interaction with oxygen in air at high temperatures. These challenges are solved by coating a ceramic material onto the piston, known as the thermal barrier coatings (TBCs), due to its low specific heat and heat transfer properties. TBCs play an important role in improving the effectiveness of elevated temperatures in industrial applications like gas turbines, automobiles and aeronautical systems. TBCs tend to quickly reduce the upper surface temperature of the piston crown. This paper highlights the prominent methods of producing thermal barrier coatings including Diffusion coating, thermal spray technique, Electric Arc Wire Spray Technique, PVD, CVD, Electrodeposition and Additive Manufacturing Method. The crucial discussion is on the materials and emerging trends in developing an efficient thermal protection system. Additionally, the review throws light on employingnovel materials like advanced ceramics, alloys and nanocomposites for their impact as TBCs. The paper also focuses on future prospects and current challenges in research and development of TBCs. Factors such as thermal conductivity, environmental stability and manufacturing processes are evaluated to meet the demands of high temperature internal combustion (IC) engine application. Finally, this brief review combines the existing information on TBCs for engineers, practitioners and scientists to understand the present practices and contribute to the improvement in thermal protection technologies in IC engines.

**Full paper: Materials Protection, DOI: https://doi.org/10.62638/ZasMat1066, Vol 66, Issue No. 1, 2025, pp 196-205.*

Benchmarking the Best Practices of Lean Six Sigma in Aerospace Industry in India: A Longitudinal Multiple Case Analysis and Roadmap for Deployment

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ABSTRACT

Purpose: This article intends to comprehend the Lean Six Sigma (LSS) approach adopted in the aerospace industry in India for process improvement. This research has the objective of determining LSS deliverables such as Voice of Customer (VOC), Key Performance Indicators (KPIs), Critical-to-Quality (CTQ), project approach, deployment strategies and tools and techniques used to execute the project.

Design/methodology/approach: The study adopted an exploratory research methodology and a multiple case study analysis to draw robust inferences. The research is carried out in the Indian aerospace industry and analyses five case studies. The case studies were collated from the company via a case study protocol with pre-defined criteria. Also, a semi-structured interview is conducted with the stakeholders of each case study to determine the deployment strategies followed during the respective projects.

Findings : It is reconfirmed that LSS is crucial in the aerospace industry, particularly in engine and gear shops, to reduce rework and rejections. Also, it was found that cost and time savings are essential KPIs. Some LSS projects require multiple CTQs for process improvement in aero industries. The DMAIC approach is used for project execution, with the Design of Experiment (DOE) being an essential tool. Top management engagement, effective HRM practices, customer focus, cross-functional collaboration and clear roles are essential for successful LSS projects. Eventually, a road map was developed based on the analysis of multiple case studies.

Research limitations/implications : The study is focused on the aerospace industry in India, which may limit the generalizability of the findings to other industries or regions. The small sample size and reliance on qualitative data through semi-structured interviews may introduce subjectivity. Additionally, the long-term effects of LSS implementation, particularly in the context of evolving technologies, were not fully explored.

Practical implications : This study provides actionable insights for aerospace companies and related organisations to enhance quality and operational performance. The developed roadmap offers a practical guide for LSS deployment, helping organisations improve efficiency and competitiveness, especially in an era of economic slowdown and high competition.

Originality/value: The study reveals similarities and differences in LSS deliverables in Indian aerospace industries, creating a roadmap and tool matrix for project execution and serving as a template for manufacturing industries.

**Full paper: Benchmarking: An International Journal, DOI: https://doi.org/10.1108/BIJ-06-2024-0511,Vol. ahead-of-print No. ahead-of-print, 2025.*

Managing Quality by Design for Sustainable Performance in the Process Industry

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ABSTRACT

This research is intended to examine the adoption of the Quality by Design (QbD) approach within a process industry setting, thereby leading to sustainable performance. Specifically, the purpose of this study is to explore the systematic integration of QbD principles into the design and control of distillation column controllers to improve product quality, operating efficiency, and sustainability. The study analyzes process variables and develops a robust system by leveraging statistical methods, quality management tools, and chemical and control engineering expertise. It is found that effective deployment of QbD methodology in process engineering requires a robust and systematic approach. Additionally, we determined that Quality Target Product Profile (QTPP) and Critical Quality Attributes (CQA) are important components for effective deployment and sustainment of QbD to achieve Sustainable Development Goals for the industries. Moreover, it is observed that including noise and control parameters is essential during the project's design phase. This study offers a systematic approach to implementing QM in industrial process design. The study highlights the potential of QbD in control engineering to enhance industrial processes and contribute to sustainability.

Full paper: Quality Management Journal, DOI:https://doi.org/10.1080/10686967.2024.2435008, Vol 32, Issue No. 1, 2025, pp 30-52.

Optimizing Diesel Engine Performance and Emissions with Heated High-Pressure Fuel Lines: An Experimental Study

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ABSTRACT

Purpose : This study aims to propose and evaluate a simpler technology to reduce harmful emissions from diesel engines by preheating the fuel before injection into the combustion chamber.

Design/methodology/approach: A spring-type heater coil with suitable insulation was installed on the high-pressure fuel pipeline to preheat the fuel. Experiments were conducted at a standard injection timing of 23° before top dead center, across 25%, 50%, 75% and 100% of full load. The fuel was preheated to 100°C, 160°C and 220°C for each engine load. Engine performance, emissions and thermal balance were analyzed for preheated and unheated diesel.

Findings : This study found that preheated fuel improved combustion characteristics, with higher pressure rise and net heat release rates during diffusion combustion. Brake thermal efficiency increased by 8.75% to 10.58%, and brake-specific fuel consumption decreased by up to 9.18%. Emissions significantly dropped: nitrogen oxides by up to 51%, smoke density by up to 63%, carbon monoxide by up to 67% and hydrocarbon by up to 25%. Thermal balance results showed increased useful work and reduced heat losses, particularly at higher preheating temperatures.

Originality/value : This research presents a novel and simpler approach to enhancing diesel engine performance and reducing emissions by preheating the fuel. The findings demonstrate significant improvements in efficiency and substantial reductions in harmful emissions, highlighting the potential of preheated fuel as a viable solution for cleaner diesel engine operation.

**Full paper: World Journal of Engineering, DOI: https://doi.org/10.1108/WJE-08-2024-0459, Online ISSN: 2515-8082, Vol. ahead-of-print No. ahead-of-print , 2025.*

A Systematic Literature Review to Assess Leadership's Role Traits Skills Competencies and Styles for Design for Lean Six Sigma Program Success

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ABSTRACT

Purpose : This systematic literature review aims to synthesise, organise and structure the stock of knowledge relating to leadership and design for Lean Six Sigma (DFLSS) and to understand leadership's role, traits, skills, competencies and styles within the context for DFLSS program success.

Design/methodology/approach : The research is based on a systematic literature review of 67 papers that were published on leadership and DFLSS, demonstrating the importance of leadership for successful DFLSS programs.

Findings : The key findings show that leadership plays a critical role in launching and sustaining a DFLSS program in organisations, while illustrating the leadership traits, skills, competencies and styles that are more conducive to a successful DFLSS program.

Originality/value: The study has identified several gaps in the literature from a practical approach and an empirical validation of the critical factors of leadership when applying and supporting DFLSS efforts supporting future initiatives.

**Full paper: International Journal of Quality & Reliability Management, DOI:10.1108/IJQRM-12-2024-0442, Vol 42, Issue No. 7, 2025, pp 1975-1994.*

Investigation of Tribological Behavior of Fused Deposition Modelling Processed Parts of Polyethylene Terephthalate Glycol Polymer Material

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ABSTRACT

In the current study an attempt is made to study the tribological characteristics of 3D printed Polyethylene Terephthalate Glycol (PETG) parts when subjected to wet sliding. Initially the Fused Deposition Modeling (FDM) of Polyethylene Terephthalate Glycol filament is carried out. The tribological characteristics like Coefficient of Friction, specific wear rate, time dependent variation of Friction force and wear are studied by conducting a wear test of the specimens. The results prove the well known theory that the addition of lubricant in between the sliding surfaces reduces the COF and wear rate. The outcomes of the pin-on-disc tests reveal that, the wear is increasing rapidly after a small period of constant wear as the test progresses. The repeated sliding motion generates frictional forces between the surfaces. Even with a relatively low COF, constant contact and movement leads to material removal. This is also observed in the frictional force versus time graph where an increase in frictional force as test progresses is observed. A COF of around 0.5 is obtained for dry siding case. In wet sliding condition, a COF of 0.2 is obtained. Hence the lubricant was effective in reducing the effect of frictional forces. A wear rate of 5×10^{-4} mm^3/Nm was attained for dry sliding case. In the present work a wear rate of 1×10^{-4} mm^3/Nm was attained in wet sliding case. From the test results of the surface Profilometer, it is found that there is a reduction in Ra, Rq and Rz values in the after sliding test condition as compared to the before test condition. As part of the practical application, there is the possibility of enhancing parts used in the aviation and automobile sectors.

**Full paper: Journal of the Institution of Engineers(India): Series D, DOI: https://doi.org/10.1007/s40033-025-00558-y, 2025.*

Quality Function Deployment in Higher Education Institutions: Results from a Pilot Survey

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ABSTRACT

Purpose : Quality Function Deployment (QFD) is an important quality management method used to define, prioritize, and transform the voice of the customer (VOC) into specific product/service requirements. This quantitative study with academics and service practitioners investigates the benefits, success factors and implementation challenges of QFD for the Higher Education Institutions (HEIs).

Design/methodology/approach: A survey questionnaire, run on a purposive sampling, was used as the instrument to collect academics and service practitioners' feedback worldwide: the format was qualitative for the characterization variables and mainly Likert scale for variables: 41 answers were collected (with a 48.2% response rate) and the questionnaire yielded 0.94 Cronbach's Alpha.

The pilot survey asked respondents to identify their level of awareness and training in QFD, the critical success factors, the most widely used QFD tools, and the areas in HEIs with the highest QFD implementation rate. Integration between Industry 4.0 technologies and QFD were also investigated.

Findings: The results show that the factors considered most important for the implementation of QFD were Leadership, QFD awareness and management commitment/support, with Voice of the Customer, House of Quality Matrix, and Affinity Diagram as the most frequently used QFD tools. Student services, Syllabus Design and Review, and Administrative were the HEIs focus areas, while Cloud Computing and Big Data and Analytics were the Industry 4.0 technologies most used in combination with QFD in HEI.

Practical implications: The identification of critical success factors and impact of QFD on Academic performances can assist HEIs in implementing QFD for Syllabus Design and Review, improving the Administrative and Student Services, and overall raising Academic performances.

Originality/value: Although there are a number of case studies of QFD applications to HEIs, this is the first quantitative study that aims to compile the critical success factors, HEIs areas with highest implementation rate, and Industry 4.0 technologies integration with QFD in HEIs.

**Full paper: Advances in Operational Excellence in the Higher Education Sector, Lecture Notes in Management and Industrial Engineering, DOI: https://doi.org/10.1007/978-3-031-84816-2_1, Springer, 2025, pp 1-13.*

Lean Tools in Higher Educational Institutions and their Impact on Operational Performance: A Scoping Review

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ABSTRACT

Purpose: The study aims to summarise the major Lean tools used in higher education institutions (HEIs) and their impact on different operational performances.
Design/methodology/approach: A scoping review was conducted to achieve this objective, systematically identifying and synthesizing relevant literature on Lean tools in HEIs, employing the PRISMA methodology for structured analysis. Journal papers from 2000 - 2024 were reviewed, focusing on peer-reviewed journals indexed in Scopus. The screening process yielded a final set of 23 acceptable studies for further analysis, considering only English-language articles and reviews focused on the adoption of Lean tools in higher education processes and their associated benefits.
Findings: Lean tools in HEIs enhance the operational performance by streamlining processes and resulting in improved service quality, increased overall efficiency and effectiveness in both academic and administrative operations. Value stream mapping (VSM) emerges as the most important technique, followed by 5S and Kaizen to foster a culture of continuous improvement.
Theoretical implications: The research contributes to the development of theory by providing an understanding of the use of lean tools and principles in the specific sector of higher education institutions and highlighting where the gaps lie in current theory about the use of these same tools in higher education. This prompted us to create new theoretical structures to achieve operational excellence in areas such as office work, academic teaching methods, student support and building maintenance at colleges and universities.
Practical implications: The benefits of using Lean tools are not only evident in key performance indicators, but also in areas such as teaching processes and the improvement of administrative processes through knowledge sharing, which enables continuous improvement and a change in the culture of quality education.
Originality: The study critically examines and categorize the Lean tools that are most relevant and applicable within the unique context of HEIs. By focusing on this sector, we address a gap in the literature, as Lean implementation has been relatively understudied compared to other methodologies and other sectors (i.e., manufacturing or service industries). To the best of our knowledge, this is the first study to categorize the Lean tools adopted in HEIs, the processes in which they have been implemented, and the benefits derived from their adoption, from an operational excellence perspective.

**Full paper: Advances in Operational Excellence in the Higher Education Sector, Lecture Notes in Management and Industrial Engineering, DOI: https://doi.org/10.1007/978-3-031-84816-2_8, Springer, 2025, pp 95-109.*

Innovations in Advanced Material Design for Enhancing Stability in Perovskites Solar Cells

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ABSTRACT

The pursuit of sustainable energy solutions has intensified the need for innovative materials for solar technology, particularly in the development of perovskite solar cells (PSCs). One primary issue is the inherent sensitivity of perovskite materials to environmental factors such as moisture, oxygen, and light, which can lead to degradation and reduced efficiency over time. The objective of this study is to explore and develop innovative advanced materials that enhance the stability and longevity of perovskite solar cells. This study presents a comprehensive investigation into the selection and characterization of semiconductor materials for photovoltaic applications, focusing on perovskites, silicon, and organic photovoltaics to analyze their optical and electronic properties. It further explores innovative device fabrication and optimization strategies, particularly through layer stacking design and tandem solar cell configurations aimed to enhance light absorption and charge transport efficiency. The research incorporates the use of transparent conductive oxides (TCOs), hole transport materials (HTMs), and electron transport materials (ETMs) to optimize the device's performance. The performance evaluation and stability testing are rigorously conducted, utilizing current–voltage (I-V) measurements under Standard Test Conditions (STC) to assess the efficiency and fill factor of solar cells. The findings show that the vapour deposition boasts the highest average efficiency at 24.0%, enabling precise control over film thickness and composition, which enhances material properties, and Recent advancements in photovoltaic technology have achieved a 28.3% efficiency in high-performance solar cells, significantly surpassing earlier mid-20 s efficiency. However, stability remains a challenge, with current stability at 26%, highlighting the need for long-term reliability in real-world conditions implemented by using MATLAB software. Future research could focus on next-generation hybrid materials, such as combining organic–inorganic perovskites with 2D materials or graphene oxide to enhance stability and performance. These innovative hybrids may improve charge transport, reduce degradation, and provide better thermal and environmental stability, leading to more durable and efficient perovskite solar cells.

**Full paper: Silicon, DOI:https://doi.org/10.1007/s12633-025-03314-7, Vol 17, Issue No. 8, 2025, pp 1841-1858.*

Synthesis and Characterization of N-Doped Reduced Graphene Oxide for the Supercapacitor Application

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ABSTRACT

In this work, N-rGO is synthesized as a material for the electrode of supercapacitors using a single-stage hydrothermal process. Ammonia functions as a nitrogen source and a reducing agent, significantly enhancing its electrochemical properties. X-ray diffractometry (XRD), Raman spectroscopy, field emission gun scanning electron microscopy (FESEM), and FT-IR (Fourier-transform infrared spectroscopy) were employed for characterization of as-prepared N-rGO electrodes. The XRD plot evidences the successful reduction of as-received GO to as-prepared N-rGO. The FESEM micrograph displays the formation of highly porous and multi-layered N-rGO, showcasing significant structural characteristics. The nitrogen atoms are successfully incorporated into the resulting material (N-rGO) and have been verified through EDS and FT-IR spectroscopy studies. The specific capacitance of N-rGO reaches 107 Fg^{-1} at 0.5 Ag^{-1} in a 0.5 M H2SO4 aqueous electrolyte solution. The electrodes showed exceptional cyclic performance, maintaining approximately 130% capacitance after 10,000 cycles and delivering steady Coulombic efficiency. The material's porous structure and nitrogen doping create abundant active sites, facilitating electrolyte ion migration and producing exceptional capacitive performance. The electrochemical impedance spectroscopy study revealed that the N-rGO exhibited a distinctive capacitive behavior. The synthesized N-rGO offers excellent potential for an efficient energy storage application due to its simple, cost-effective, and eco-friendly approach.

**Full paper: Journal of Materials Science: Materials in Electronics, DOI: https://doi.org/10.1007/s10854-025-14646-w, Vol 36, Issue No. 10, 2025, pp 1-19.*

Fabrication and Wear Characteristics of Al6066-Boron Carbide Particulate Composites

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ABSTRACT

Advanced high performance light weight composite materials have been highly demanded due to rapidly progressing technical activities in aerospace, transportation and automobile over the past three decades. This study focuses on the synthesis and wear features of Al6066-B4C composites. The Al6066-B4C composites are manufactured by employing stir casting technique with the varying percentage of Boron carbide i.e. from 3 to 12% in increments of 3%. Al6066-B4C particulate composites are analyzed for microstructure study, hardness, and wear properties. The distribution of B4C particles is found to be even within the Al6066 matrix from the microstructure study of Al6066-B4C composites. The hardness of the composite has increased from 0 to 9%, with a 37.08% increase. The wear rate as well as COF of the Al6066-B4C composite declined from 0 to 9% as the amount of B4C weight fraction increased. It reduces wear rate by 38.07%. This has led to a decrement of 21.21% in the COF. In addition, wear rate as well as COF enhances with the applied load. The developed composites are used in automotive applications.

**Full paper: Journal of the Institution of Engineers(India): Series D, DOI: https://doi.org/10.1007/s40033-025-00887-w, 2025.*

Optimization of Current Density for Nickel–Chromium (Ni-Cr) Alloy Coating on Copper: An Experimental Approach

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ABSTRACT

Conventional nickel/chromium electroplating can only meet a few new technological demands. Deposits with better properties must be tailor-made to meet present-day technology needs. This article is aimed to study the effect of plating parameters like current density, pulse current plating and plating time on the cathode current efficiency of Ni–Cr alloy plating on copper substrate. The primary purpose of this study is to determine the optimal plating parameters for plating nickel–chromium alloys by using experimental analysis. Parameters such as current density, plating time and type of current supply (DC/ Pulse) were considered for the analysis to determine the optimum plating parameters. The obtained optimal parameters were validated at four levels. First, coatings of Ni–Cr on copper substrates were developed, and outcomes were analysed. Secondly, the surface morphology of the coatings is examined using the Field Emission Scanning Electron Microscope (FESEM) technique. Thirdly, Energy Dispersive Spectroscopy (EDS) is performed on coated samples to evaluate the coating's composition. Finally, X-ray Diffraction (XRD) is used to detect the phase of nickel–chromium deposits. XRD graphs demonstrate FCC structures for nickel and chromium with peaks 2θ angles around 45.5°, 52° and 77.5°. This shows a good crystalline layer of Ni–Cr alloy formed. SEM images indicate a homogeneous and dense morphology with fine grain size, representing effective alloying and uniform coating of the substrate. The results of this study indicate that coating parameters significantly influence the current efficiency during plating. The structure and nature of the coating depend on these parameters. The optimum plating parameters for Ni–Cr alloy plating on copper were found at a current density of 6 A dm^{-2} at pulse 3 and 10 min of plating time. New alloy electrodeposits with improved surface and mechanical properties are being explored. The study's findings will help the automobile industry since it provides optimal plating parameters to get the alloy plating as a single-step coating.

**Full Paper: Discover Applied Sciences, DOI: https://doi.org/10.1007/s42452-025-06738-3, Vol 7, Article No. 324, 2025.*

Harnessing Machine Learning Approach for Hardness Optimization of Al-Si Alloy Composites Reinforced with Coconut Shell Ash

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ABSTRACT

Purpose. The purpose of this study was to utilize Machine Learning (ML)to optimize the hardness of aluminum-silicon (Al-Si) alloy composites reinforced with Coconut Shell Ash (CSA). Specifically, the study focused on leveraging ML techniques to accurately predict material properties and streamline optimization. Also, the study intended to optimize the composition and process parameters simultaneously through the ML approach. Methodology. The study used Minitab's Automated Machine Learning (AutoML), specifically the TreeNet model, to develop a predictive model for hardness. The input parameters included Al-Si alloy content, CSA content, melting temperature, and stirring speed. The model was trained and validated using experimental data, and hyperparameter tuning was performed to improve accuracy. The optimal settings were then experimentally verified to assess the model's reliability. Findings. The optimal composition for maximizing hardness was 90 wt% Al-Si alloy and 10 wt% CSA, with a melting temperature of 800 °C and a stirring speed of 800 rpm. The experimental results validated the model's predictions, with a hardness value of 70.9 BHN. The study demonstrated that CSA can be an effective, eco-friendly reinforcement for Al-Si composites, enhancing mechanical properties and promoting sustainability. Practical Implications. The findings have significant implications for industries such as automotive, aerospace, and defense, where lightweight, high-strength materials are critical. The ML-based approach used in this study can reduce the need for extensive experimental testing, offering a practical and efficient method for optimizing composite materials. Using CSA as a reinforcement also contributes to sustainable manufacturing by utilizing agricultural waste. Originality. This study presents an innovative approach by integrating ML into optimizing metal matrix composites, specifically using an eco-friendly reinforcement material. The article offers a novel contribution to materials science and sustainable engineering through a novel and structured step-by-step AutoML approach.

**Full paper: Materials Research Express, DOI: 10.1088/2053-1591/adc5c9, Vol 12, Issue No. 4, 2025, pp 1-19.*

Influence of Zirconium Carbide Particles on the Mechanical Characteristics of Heat Treated Al7475 Alloy

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ABSTRACT

Aluminium alloys exhibits excellent properties and therefore they are used broadly in automobile, aviation, and defence sectors. The studies on the effect of zirconium carbide (ZrC) particulates on the mechanical properties of heat-treated stir-cast Al7475 alloy are still in the initial stage. Hence, the present study is aimed at the study of microstructure and mechanical characteristics of as-stir-cast and heat-treated stir-cast Al7475-ZrC composites. The zirconium carbide particulates concentration ranges from 2 to 8 wt% in Al7475 alloy. The Al7475 alloy and Al7475-ZrC composites were T6 heat-treated. Both the Al7475 alloy and the Al7475-ZrC composites have undergone significant microstructure refinement owing to heat treatment. The SEM micrographs of heat-treated stir-cast Al7475-ZrC composites have revealed that the matrices of Al7475 composites consisted of a fine dispersion of uniformly distributed ZrC particles that eventually resulted in a considerable improvement in the properties of composites. The mechanical properties of heat-treated stir-cast Al7475-ZrC composites were superior to that of as-stir-cast Al7475-ZrC composites. The optimum values of UTS of as-stir-cast and heat-treated stir-cast Al7475-ZrC composites are 104.42 N/mm2 and 121.95 N/mm2, correspondingly. The optimum values of compression strength of as-stir-cast and heat-treated stir-cast Al7475-ZrC composites are 665.43 N/mm2 and 789.68 N/mm2, correspondingly. The optimum values of the hardness of as-stir-cast and heat-treated stir-cast Al7475-ZrC composites are 103.74 BHN and 126.86 BHN, respectively. The optimum values of impact strength of as-stir-cast and heat-treated stir-cast Al7475-ZrC composites are 16 J/mm2 and 19 J/mm2, respectively. Among heat-treated stir-cast composites, Al7475-6%ZrC composite has the highest enhancement in mechanical characteristics, and the UTS, compression strength, and hardness are 15%, 16%, and 18% higher than that of as-stir-cast Al7475-6%ZrC composite and 19%, 14% and 10% higher than that of heat-treated stir-cast Al7475 alloy respectively.

**Full paper: Scientific Report, DOI: https://doi.org/10.1038/s41598-025-99221-3, Vol 15, Article No. 15011, 2025, pp 1-17.*

Aligning Quality Management and Sustainability: A Cross-Industry Analysis of Case Studies for Achieving UNSDGs

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ABSTRACT

Purpose:This study investigates the alignment of quality management (QM) practices with sustainability dimensions to achieve the United Nations Sustainable Development Goals (UNSDGs) in Indian industries. The study investigates how these industries utilise QM tools to advance sustainability, mainly focusing on environmental, social, governance, economic and operational sustainability.
Design/methodology/approach:A multiple-case study approach was employed, analysing 41 case studies submitted to the International Academy for Quality (IAQ) for the Quality Sustainability Award. The data were collected from various Indian industries and analysed through within-case and cross-case comparisons, focusing on applying QM practices and their alignment with sustainability dimensions. The research methodology utilised both qualitative and quantitative analysis techniques.
Findings:The findings reveal that industries predominantly use Six Sigma, lean tools, PDCA and root cause analysis (RCA) to address operational and environmental challenges. The most frequently addressed UNSDGs include Goal 12 (Responsible Consumption and Production), Goal 9 (Industry Innovation and Infrastructure) and Goal 13 (Climate Action). Significant improvements were observed in defect reduction, energy efficiency and cost management. However, the study also highlights gaps in addressing social sustainability, particularly in areas like diversity and inclusion.
Practical implications:This research provides practitioners with insights on aligning QM tools with sustainability initiatives to ensure operational excellence while addressing environmental and social challenges. For policymakers, the study highlights the need for regulatory frameworks supporting UNSDGs through QM, emphasising social responsibility mandates. At the same time, academicians can leverage the findings to explore new QM-based sustainability models.
Originality/value:This research contributes uniquely to the literature by conducting a cross-sectoral analysis within a consistent regulatory environment in India. Unlike multinational studies where legal and regulatory variations can affect comparability, this study provides a controlled context that enhances the reliability of cross-sector comparisons. This allows for clearer insights into implementing QM practices to achieve sustainability across various sectors. Additionally, the study highlights the role of advanced technologies in enhancing operational efficiency and sustainability while identifying areas for improvement, such as the broader adoption of I4.0 (Industry 4.0) tools and a more balanced focus on social sustainability.

**Full paper: International Journal of Quality & Reliability Management, DOI: https://doi.org/10.1108/IJQRM-12-2024-0428, Vol 42, Issue No. 10, 2025, pp 2650-2674.*

Investigation of Solid-State Hydrogen Storage Performance using Multiple Phase Change Materials

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ABSTRACT

In this study, the concept of integrating multiple annular phase change materials (PCM) with a metal hydride (MH) reactor is investigated to enhance hydrogen storage efficiency. A detailed mathematical model is developed to represent hydrogen storage in the MH and latent heat storage in the PCM. The selected metal hydride is the low-temperature $LaNi_5$, and the three PCMs used— $CaCl2{\cdot}6H2O$, $LiNO3.3H2O$, and $Na2CO3.10H2O$—are chosen based on compatibility of their solidus and liquidus temperatures with the MH. An initial study highlights the critical importance of accounting for buoyancy effects in PCM simulations, particularly in cases where significant temperature gradients lead to density variations and strong natural convection. This effect has been overlooked in several previous studies. Incorporating the buoyancy effect into the numerical model leads to a significant reduction of approximately 27.41 % in the time required to achieve 90 % hydrogen storage, resulting in discrepancies and substantial variations in the local distribution of key parameters compared to model that do not account for this effect. The results indicate that the MH bed with $LiNO3{\cdot}3H2O$ outperforms the MH bed with $CaCl2{\cdot}6H2O$ by 51.6 % and $Na2CO3{\cdot}10H_2O$ by 14.12 % in terms of hydrogen storage performance. The simulations with annular two layers of PCMs show that the combination of $LiNO3{\cdot}3H2O$ and $CaCl2{\cdot}6H2O$ significantly outperforms the other two possible combinations, and it is 4 % more effective for hydrogen storage compared to using $LiNO3{\cdot}3H2O$ alone. The findings of the present study emphasize the potential of combining multiple PCMs with MH reactors to optimize the efficiency of hydrogen storage systems across various applications.

**Full paper: Journal of Energy Storage, DOI: https://doi.org/10.1016/j.est.2025.117082, Vol 127, Article No. 117082, 2025, pp 1-17.*

Recent Developments in the Immersed Boundary Method for Complex Fluid–Structure Interactions: A Review

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ABSTRACT

The "immersed boundary method (IBM)" is considered to be the most efficacious and versatile technique to solve flow problems associated with intricate geometries. The first part of this review examines recent advancements in IBM, essential for the simulation of "fluid–structure interactions (FSIs)" in sophisticated systems. This review highlights significant developments in turbulence modeling, adaptive mesh refinement, and complex geometric simulations, demonstrating IB methods' capacity to seamlessly integrate arbitrary geometries into structured computational grids while preserving computational efficiency. Various IB techniques are analyzed for enforcing boundary conditions on dynamic immersed boundaries, with notable breakthroughs in managing velocity discontinuities, spurious oscillations, and large-scale deformations. Recent findings illustrate the versatility of IB methods, with applications encompassing biological fluid dynamics, turbulent multiphase flows, and cavitating flows. These innovations not only enhance computational performance but also address evolving challenges across engineering and scientific fields, establishing IB methods as a robust tool for resolving complex, multidisciplinary problems with high accuracy and efficiency.

**Full paper: Fluids, DOI:https://doi.org/10.3390/fluids10050134, Vol 10, Issue No. 5, 2025, pp 1-46.*

Synergistic Effects of E-Glass and Coir Fibers on the Mechanical Properties of Epoxy Composites

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ABSTRACT

Fiber-reinforced polymer (FRP) composites are widely employed in diverse engineering applications due to their advantageous properties, including high specific strength, ease of fabrication, and cost-effective production. These composites typically incorporate either synthetic or natural fibers as reinforcement. Although synthetic fibers such as glass and carbon offer superior mechanical performance, their high production costs limit broader use. In recent years, natural fiber-based composites have garnered significant attention as sustainable alternatives, offering environmental benefits and economic viability. This study focuses on the development and characterization of hybrid epoxy composites reinforced with coconut coir and E-glass fibers. The objective is to evaluate the potential of these materials for use in furniture manufacturing by investigating their physical and mechanical properties. Emphasis is placed on analyzing the effects of varying fiber content and matrix composition on tensile strength and moisture absorption behavior. The experimental results are compared to assess the synergy between natural and synthetic fibers within the hybrid composite system, providing insights into optimizing composite design for enhanced performance and sustainability.

**Full paper: YMER, DOI: 10.37896/YMER24.05/E0, Vol 24, Issue No. 5, 2025, pp 1883-1891.*

Enhancing Energy Efficiency of Industrial Boiler Application by the Integration of Ground-Source Heat Pumps and Photovoltaic-thermal Solar Water Collectors

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ABSTRACT

The primary aim of this study is to develop a hybrid system that maximizes thermal and electrical energy outputs, reduces operational costs, improves environmental performance, and ensures reliable operation. The experimental setup involved installing the hybrid system in a residential test facility equipped with instrumentation for real-time monitoring and control. Performance testing was conducted under various operating conditions, measuring the thermal and electrical outputs of the PVT collectors with embedded PV cells, GSHP performance, and overall system efficiency. The system's performance was evaluated in both heating and cooling modes, with results indicating a GSHP Coefficient of Performance (COP) of 4.2 during winter heating and a PVT collector efficiency of 18 %. Significant reductions were observed in annual heating loads and grid-purchased electricity compared to traditional systems. Optimization was achieved using a hybrid approach that combined Genetic Algorithms (GA) and machine learning (ML) techniques, which iteratively improved system design and operational strategies. The conclusion highlights that the integrated GSHP and PVT system substantially enhances energy efficiency, reduces greenhouse gas emissions, and offers a payback period of approximately 4.67 years. Future work will focus on further optimization and real-time operational refinements to ensure adaptability to varying industrial conditions.

Full paper: Case Studies in Thermal Engineering, DOI: https://doi.org/10.1016/j.csite.2025.106550, Vol 73, Article No 106550, 2025, pp 1-18.

Enhancing the Interfacial Adhesion and Mechanical Strength of Pultruded ECR–Glass Fiber Composites with Nanofiller-Infused Epoxy Resin

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ABSTRACT

The effect of the interaction between silica (nS) and hydroxyapatite (nHap) nanomaterials on the characteristics of unidirectional glass-fiber-reinforced epoxy (GF/Ep) composite systems is investigated in this work. The goal of the study is to use these nanofillers to improve the microstructure and mechanical characteristics. Pultrusion was used to produce hybrid nanocomposites while keeping the GF loading at a consistent 75% by weight. The hybrid nanocomposites were made with a total filler loading of 6 wt.%, including nHap, and a nS loading ranging from 2 to 4 wt.%. The mechanical performance of the composite was greatly improved by the use of these nanofillers. Compared to neat GF/Ep, hybrid nanocomposites with 6 wt.% combined fillers exhibited increased hardness (14%), tensile strength (25%), interlaminar shear strength (21.3%), and flexural strength (33%). These improvements are attributed to efficient filler dispersion, enhanced fiber-matrix adhesion, and crack propagation resistance. Incorporating 4 wt.% nS alone improved hardness (6%), tensile strength (9%), tensile modulus (21%), interlaminar shear strength (11.4%), flexural strength (12%), and flexural modulus (14%). FTIR analysis indicated Si-O-Si network formation and increased hydrogen bonding, supporting enhanced interfacial interactions. Ultraviolet reflectance measurements showed increased UV reflectivity with nS, especially in hybrid systems, due to synergistic effects. Impact strength also improved, with a notable 11.6% increase observed in the hybrid nanocomposite. Scanning and transmission electron microscopy confirmed that the nanofillers act as secondary reinforcements within the matrix. These hybrid nanocomposites present a promising material choice for various industries, including marine structural applications and automotive components.

**Full paper: Journal of Composites Science, DOI:https://doi.org/10.3390/jcs9070321, Vol 9, Issue No. 7, 2025, pp 1-28.*

Study of Optimization of Process Parameters on the Wear Behaviour of Al7075–Aluminium Oxide Composites using Taguchi Approach

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ABSTRACT

Aluminium alloy based composites are employed in numerous applications that require outstanding performance due to their superior mechanical characteristics, including higher strength, stiffness, and wear resistance. They are used in engine parts like pistons and connecting rods to improve performance and durability. In this work, Al7075 is employed as the matrix material. Aluminium oxide particulates were chosen as the reinforcing particles. The Al7075–6%Al2O3 composites were manufactured using the stir casting technology. Scanning electron microscopic instrument was employed to investigate the microstructure of Al7075–6%Al2O3 composites. The microstructure analysis of Al7075–6%Al2O3 composites revealed the even dispersion of Al2O3 particulates throughout the Al7075 matrix. The Pin on disc apparatus was utilized to conduct a wear experiment on Al7075–Al2O3 composites. Taguchi methodology was employed to optimize the wear process factors of the produced composites for enhanced performance. According to ANOVA outcomes, the most impacting factor was the sliding distance 87.057% then speed 7.165% and lastly load 0.435%. The R-Sq value and R-Sq (adj) value for wear response obtained using Minitab 16 Taguchi software are 95.05% and 92.08% respectively. The delta values for load, speed and sliding distance are 0.668, 2.830 and 10.734 respectively. The results of this demonstrated that the factor that has the greatest impact is sliding distance. The wear response values provided by OA experimental and regression equation are 3.6131 × 10−3 mm3/m and 3.3062 × 10−3 mm3/m respectively. A difference of 8.49% between the experimental and Taguchi analysis value gives the maximum permissible difference.

Full paper: Scientific Reports, DOI: doi: 10.1038/s41598-025-05188-6, Vol 15, Issue No.1, 2025.

Influence of Titanium on the Microstructure and Wear Properties of Spray-Formed Hypereutectic Al-Si Alloys

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ABSTRACT

The present study explored the development of hypereutectic Al-Si alloys such as Al-15Si (SF1), Al-15Si0.5Ti (SF2), Al-15Si-1.0Ti (SF3), and Al-15Si-2Ti (SF4) alloys by spray forming, a technique that yields refined microstructures with minimal segregation, and examined the effects of titanium (Ti) on the microstructure and wear properties of alloys at various temperatures. Microstructural analysis revealed equiaxed aluminum (Al) matrices with distributed silicon (Si) phases and Al3Ti intermetallics in Ti-containing alloys. The addition of Ti refined the microstructure and enhanced the refinement of Si particles. The hardness increased as Ti content increased in the alloy, with spray-formed alloys (SF) exhibiting 30- 35% higher hardness than their as-cast (AC) counterparts at all temperatures. The SF alloys demonstrated improved wear resistance, with 50-65% lower wear rates than AC alloys at 25 C and 68-82% lower at 250 C. Specifically, the Al-15Si-2Ti SF alloy exhibited 62% and 82% lower wear rates than Al-15Si-2TiAC alloy at 25 C and 250 C, respectively. The coefficient of friction (COF) decreased with load for both AC and SF alloys, while COF values increased as the temperature increased. The AC alloys exhibited a 21-35% increase in coefficient of friction (l) per unit rise in temperature, while SF alloys showed a significantly lower increase of 0.18-0.29%. The SF4 alloy demonstrated the lowest COF across the entire load and temperature range. Spray-formed hypereutectic Al-Si-Ti alloys demonstrate a high potential for aerospace and automotive applications due to their refined microstructure and enhanced wear resistance, achieved through addition of Ti, making them suitable for high-performing applications

Full paper: Journal of Materials Engineering and Performance, DOI: https://doi.org/10.1007/s11665-025-11759-5, Vol. ahead-of-print No. ahead-of-print, 2025.

Fabrication and Mechanical Behavior of Kevlar® Fabric-Reinforced Epoxy Matrix Composites Modified by Potassium Titanate Whiskers

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ABSTRACT

Polymer matrix composites have become quite popular in the field of materials engineering owing to their high strength to weight ratios and cost effectiveness. Several synthetic fibers have been employed as reinforcement with thermoset resin as the matrix in order to achieve improved mechanical or tribological performance of the composite. A secondary reinforcement known as filler is believed to further enhance these properties. In this paper, the influence of Potassium Titanate Whiskers (PTW) as reinforcing fillers on the mechanical performance of Kevlar ® /Epoxy composite combination has been discussed. Composite samples were fabricated by hand lay-up method followed by compression by altering the weight percentage of the whiskers in the order of 0%, 2%, 4%, 6% and 8%. Mechanical tests like tensile, flexural, impact and hardness were conducted on the developed composite samples as per ASTM standards. The results indicated that the inclusion of PTW into Kevlar® /Epoxy system influenced the mechanical properties of the composites. Compared to the unfilled composites, the tensile strength increased by 6.39%, flexural strength increased by 6.32%, impact strength increased by 22.96%, and Shore D hardness value increased by 9.62% for 2 wt. % PTW. However, the mechanical properties showed a declining trend beyond PTW loading of 2 wt. %. Selected tensile specimens were analyzed through Scanning Electron Microscope (SEM) images to understand their failure mechanisms.

**Full paper: Research on Engineering Structures and Materials, DOI: https://doi.org/10.17515/resm2025-632me0120rs, Vol 11, Issue No. 6, 2025, pp 3393-3404.*

Integrating Industry 4.0 Tools into the Six Sigma DMAIC Phases: A Pathway to Digital-Driven Quality Improvement

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ABSTRACT

Purpose: The aim is to investigate the incorporation of Industry 4.0 (I4.0) technologies into the Six Sigma DMAIC (Define, Measure, Analyse, Improve, Control) framework. By focusing on enhancing process efficiency, quality management (QM), and operational performance, the study intended to offer a structured, phase-specific methodology. The objective is to present a detailed guide to systematically employing I4.0 tools, demonstrating their application across each stage of the DMAIC process to achieve improved outcomes.

Design/methodology/approach – The study employed a qualitative approach, conducting focus group discussions with Six Sigma and I4.0 experts from diverse industrial sectors. Thematic analysis was conducted to gain insights into the practical application of I4.0 technologies within the DMAIC framework. Additionally, a scoping review of existing literature was undertaken to identify gaps and opportunities, supporting the development of a comprehensive framework for integrating I4.0 tools into QM practices.

Findings – The findings indicate that I4.0 technologies significantly enhance the DMAIC phases by facilitating real-time data acquisition, advanced predictive analytics, and automated processes. Tools such as cloud-based platforms, IoT systems, and AI-driven analytical solutions contribute to greater precision and flexibility across all phases, from defining customer needs to maintaining control over process variations. These insights provide actionable guidance for integrating Industry 4.0 technologies into Six Sigma practices, resulting in improved outcomes and a sustained competitive advantage.

Originality/value – This research is one of the few studies to offer a detailed, phase-specific framework for incorporating I4.0 technologies into the Six Sigma DMAIC methodology. It enriches both theoretical understanding and practical applications in digital transformation within QM by addressing a significant gap in the existing literature. Its uniqueness stems from a comprehensive approach that merges empirical insights from industry professionals with a well-structured implementation guide tailored for practitioners.

**Full paper: The TQM Journal, DOI: https://doi.org/10.1108/TQM-04-2025-0247, 2025, pp 1-31.*

Advances in Flow-Structure Interaction and Multiphysics Applications: An Immersed Boundary Perspective

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ABSTRACT

This article discusses contemporary strategies to deal with immersed boundary (IB) frameworks useful for analyzing flow–structure interaction in complex settings. It focuses on immense advancements in various fields: biology, oscillation of structures due to fluid flow, deformable materials, thermal processes, settling particles, multiphase systems, and sound propagation. The discussion also involves a review of techniques addressing moving boundary conditions at complex interfaces. Evaluating practical examples and theoretical challenges that have been addressed by these frameworks are another focus of the article. Important results highlight the integration of IB methods with adaptive mesh refinement and high-order accuracy techniques, which enormously improve computational efficiency and precision in modeling complex solid–fluid interactions. The article also describes the evolution of IB methodologies in tackling problems of energy harvesting, bio-inspiration propulsion, and thermal-fluid coupling, which extends IB methodologies broadly in many scientific and industrial areas. More importantly, by bringing together different insights and paradigms from across disciplines, the study highlights the emerging trends in IB methodologies towards solving some of the most intricate challenges within the technical and scientific domains.

Full paper:Fluids, DOI: https://doi.org/10.3390/fluids10080217, Vol 10, Issue No. 8, 2025, pp 1-70.

Effect of Nickel on the Mechanical Properties of Spray-Formed Al-15Si-2Cu Alloy at Elevated Temperatures

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ABSTRACT

In the present study, the effect of nickel (Ni) on the mechanical properties of spray-formed (SF) Al-15Si-2Cu alloy at different temperatures was examined and evaluated with that of the as-cast (AC) alloy. The microstructure of SF alloys revealed uniformly distributed spherical shaped primary silicon and eutectic silicon phases along with fine Ni and Cu intermetallic particles dispersed throughout the equiaxed Al matrix. The microstructure of AC alloys consisted of coarse primary Si, flake-type eutectic phase, Cu-rich intermetallics with a complex branched morphology and a network of short strips. The mechanical properties of the alloys were assessed at temperatures of 30°C, 100°C, 200°C and 300°C. The SF alloys exhibited higher hardness than AC alloys at all temperatures with a maximum increase of 74 % at 30°C. The hardness of alloys showed a decreasing trend with increasing temperature. The mechanical strength of SF alloys was higher than that of the AC alloys across the entire temperature range from 30°C to 300°C with a decrease in ultimate tensile strength (UTS) by 4–6 % at 250°C. The SF alloys demonstrated a significant increase in UTS (25 % at 30°C and 40 % at 300°C) compared to the AC alloys. The Al-15Si-2Cu-2Ni alloy showed highest increase (14.3–18.6 %) and Al-15Si-2Cu-6Ni alloy showed the lowest increase (10.5 % to 14 %) in percent elongation between 30°C and 300°C.

Full paper: Journal of Alloys and Compounds, DOI:https://doi.org/10.1016/j.jallcom.2025.183431, Vol 1040, Article No. 183431, 2025, pp 1-16.

Arduino-Based Battery-Operated MultiPurpose Portable Seed-Sowing Machine

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ABSTRACT

Agriculture plays a crucial role in contributing about 17% of the gross domestic production (GDP) in India. The zest of rural population in India relies on farming and associated activities for their income. The use of traditional tools for agricultural activities like plow, spade, sickle, thresher, etc., gives less yield. Even though a lot of developments related to mechanization and automation of activities related to agriculture and farming are introduced, most of them are suitable for large-scale agriculturalists and farmers. The large-scale farmers associated with mass production are equipped with machines for cropping, thereby making huge profits. There is a need to develop automated/semi-automated systems for medium-or small-scale agricultural activities which would be energy efficient, easy to use and maintain, and economical. The manufacturers of agricultural machineries introduce machines which are imported in design, expensive, and suitable for large-scale applications like tillers, tractors, etc. However, developing and utilizing machines for specific purposes have been a challenge. The seed-sowing machines assist farmers in utilizing time and money to sow seeds in the desired position. In this chapter, the design and development of an Arduino-based battery-operated seed-sowing machine is discussed. The machine uses Arduino-controlled servo motors for controlled spacing and sowing of seeds. The battery eliminates the need for electricity to power the device. The Arduino-controlled design provides farmers a great level of precision and control over the operation of the machine. The depth, speed of tiller blades, and other parameters can be adjusted for the optimal performance of different types of crops and soil. The machine was tested for sowing the different types of seeds at a speed of 75 rpm. The motor and the battery capacities are 250 W and 21 Ah, respectively, and the battery charge will last for 1.3 hours. Overall, the Arduino-controlled multi-purpose seed-sowing machine is a valuable addition to the modern agricultural sector that helps the farmers to increase productivity, efficiency, and profitability. The proposed design is simple to use; hence, even an unskilled farmer can handle it. The chapter also discusses a comprehensive analysis on semi- and fully automated seed-sowing machines for agricultural purposes. Some of the shortcomings of traditional machines and practices are also compiled in this chapter. The scope for further improvement in seed-sowing machines and features is highlighted in the chapter, which encourages researchers to carry forward this research.

**Full paper: Digital Convergence in Intelligent Mobility Systems, DOI:10.1002/9781394275274.ch1, 2025, pp 1-23.*

Spice Quality: A Six Sigma Approach to Increasing SCAN Colour in a Paprika Production Process

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ABSTRACT

Purpose: This study aims to improve the Standard Colour Analysis (SCAN) values and overall production quality of paprika powder, a spice of substantial market importance. Moreover, the investigation is intended to identify the key factors that significantly influence the SCAN colour of paprika.

Design/methodology/approach: The article adopted a case study methodology to attain the research objectives. In addition, it utilized Six Sigma DMAIC phases to unearth the potential causes that influence the variation in the quality of the product. Advanced statistical methodologies such as DoE and multiple regressions are incorporated to validate the potential causes and draw robust inferences.

Findings: It is determined that water content or moisture levels before and after blending significantly affect the SCAN colour. Additionally, it is uncovered that dryer parameters – specifically temperature and conveyor belt speed – impact moisture and colour attributes across different pepper characteristic clusters. By applying Six Sigma methodologies, the research provides actionable insights and process adjustments that led to a 10-percentage point increase in compliant batches, rising from 5 to 15% within four months.

Research limitations/implications: The study's outcomes have practical implications for the spice processing industry. By identifying factors that affect colour and moisture in paprika powder, the study provides a valuable reference for optimising production processes and enhancing overall product quality. Nevertheless, the study considered only control parameters during the study.

Originality/value: This study contributes to the existing literature by demonstrating the applicability of the Six Sigma DMAIC model in complex agricultural and food processing environments, where natural variability, quality consistency and customer-driven specifications converge. By focusing on colour attributes and moisture – two critical yet underexplored quality parameters in industrial paprika production – the research offers a replicable methodology for process optimization and adds practical value to the continuous improvement literature. Furthermore, the study supports the United Nations Sustainable Development Goals (SDGs), particularly SDG 9 (Industry, Innovation and Infrastructure) and SDG 12 (Responsible Consumption and Production), by enhancing process efficiency and minimizing production waste.

**Full paper: International Journal of Productivity and Performance Management, DOI: https://doi.org/10.1108/IJPPM-12-2024-0850, Vol 74, Issue No.10, 2025, pp 3621-3648.*

Wear Performance of Polymer Matrix Composites Reinforced with Aramid Fibers and Modified with Ceramic Nano-Powders

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ABSTRACT

Tribology is a field that focuses on the study of lubrication, wear and friction occurring between contacting surfaces in relative motion. Polymer composites have gained attention particularly in situations where mating parts are subjected to increased wear and friction. In this work, epoxy polymer matrix is reinforced with an aramid fiber namely Kevlar and is modified with ceramic nano powders namely potassium titanate whiskers. The composites are prepared by hand lay-up followed by compression. The fabricated samples are subjected to pin-on-disc wear test as per ASTM G99-17. Experiments are designed and analyzed using MINITAB 22 following a Taguchi L9 orthogonal array with four parameters at three levels each. Density and specific wear rate of the specimens are evaluated. The density test results revealed slight improvement in the composite's density with the increase in the nano powder content from 0 wt. % to 4 wt. %. The experimental values of specific wear rate and the S/N ratios obtained from Taguchi analysis indicated that the minimum specific wear rate was achieved for sliding velocity(A) of 2.5 m/s, normal load (B) of 90 N, powder content (C) of 4 wt. % and sliding distance (D) of 3000 m. ANOVA results indicated that the sliding distance had the most significant impact on the wear of the composites followed by sliding velocity, normal load and percentage powder content.

Full paper: Journal of Environmental. Nanotechnology, DOI: https://doi.org/10.13074/jent.2025.06.2521483, Vol 14, Issue No. 2, 2025, pp 182-188.

Impact of AICTE IDEA Lab Training on Skill Development of Diploma College Students in Advanced Manufacturing

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ABSTRACT

This paper evaluates the impact of a series of three-day All India Council for Technical Education (AICTE) IDEA (Idea Development, Evaluation, and Application) Lab workshops designed to enhance the skill development of polytechnic students of various colleges in advanced manufacturing. The workshop delivered a comprehensive educational experience by integrating hands-on training in advanced manufacturing processes, including 3D printing, laser cutting & etching, 3D scanning, and CNC wood routing. In addition, it introduced participants to design thinking and engaged them in project-based learning (PBL) focused on product development. Feedback data indicated a significant improvement in participants' self-assessed understanding, with average ratings rising from 2.9 before the workshop to 4.1 afterward, reflecting a notable enhancement in their theoretical knowledge. Furthermore, the workshop successfully boosted students' confidence in applying the techniques learned, with 52 out of 60 students expressing a strong interest in participating in future advanced workshops. Evaluations also revealed high levels of satisfaction with the workshop's content, structure, and the effectiveness of the instructors. The positive feedback highlights the workshop's success in bridging knowledge gaps, fostering practical skills, and generating enthusiasm for continued learning in advanced manufacturing. Overall, these findings demonstrate that the workshops have a significant impact on preparing students for future challenges in the field, greatly enhancing their capabilities and confidence in advanced manufacturing while also strengthening their STEM competencies.

**Full paper: Journal of Engineering Education Transformations,DOI: https://doi.org/10.16920/jeet/2025/v38is2/25049, Vol 38, Special Issue 2, 2025, pp 405-411.*

Evaluating the Impact of Participation in the SAEINDIA Collegiate Club Activities on Engineering Education

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ABSTRACT

The paper assesses the impact the involvement of Engineering students has on the academics, employability and personal development in SAEIndia Club. The study discusses the skill gap in engineering education and the degree of impact of extracurricular activities in promoting holistic development of engineering graduates through a thorough review of literature. Using a mixed approach of multiple statistical analysis which include correlation analysis, paired t-Tests and Chi-Sqaure tests, the paper evaluates the viable outcomes that the candidates have experienced in terms of their leadership development, career advancement, academic performance and alignment of the activities of the club towards curriculum. The outcomes indicate significant implications on the candidates who involve in the club activities for a longer period with improvements evident on lines of improved communication skills, project management abilities, and at large leadership skills The influence is found to be uniform across demography: both male and female though a considerable difference is found in leadership positions held with male candidates holding higher positions. This difference is attributed to the factors like travel, physical exertions and limited facilities at the competition sites which is detrimental and also refers to creation of a conducive environment across the competitions at various stages to make it apt for female participants as well. While the impact is evident and promising, the study also refers to the fact that the activities and objectives need to be streamline to cater to a larger audience and hence help building the essential skills both technical and life skills. The data backed study points at the difference that the club has made to the candidates who were part of it. This refers to the need for more technical clubs that can drive skilling and aid in preparing engineers who are future-ready. This will also enable institutions to bridge the gap between knowledge delivered in classrooms and the practical skill sets that the industry looks to help graduates build a career in the contemporary world.

**Full paper: Journal of Engineering Education Transformations, DOI: https://doi.org/10.16920/jeet/2025/v38is2/25006, Vol 38, Special Issue 2, 2025, pp 38-46.*

Dry Sliding Wear Behavior of SiC-Reinforced Al-Si Eutectic Metal Matrix Composite

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ABSTRACT

This study investigates the effect of sliding parameters on the dry sliding wear behavior of (silicon carbide) SiC-reinforced (aluminum silicon) Al-Si eutectic metal matrix composites (MMCs) with 1.5 wt% of magnesium (Mg). The composites were fabricated by incorporating varying amounts of SiC particles into the aluminum-silicon matrix to improve wear resistance. A comprehensive wear analysis was conducted under different sliding speeds, normal loads, sliding distances, and SiC reinforcement contents. The Taguchi method was used to optimize the wear performance, with signal-to-noise (SN) ratios employed to assess the influence of each sliding parameter. The findings show that wear rate is mainly influenced by SiC content (32.04%), normal load (30.98%), and sliding speed (10.99%), while the coefficient of friction (COF) is largely affected by normal load (38.51%), SiC content (34.46%), and sliding distance (23.51%). The study also reveals that the addition of SiC reinforcement improves the wear resistance of the developed composite. The findings suggest that optimizing these parameters can significantly reduce wear, making these composites suitable for advanced engineering applications where high wear resistance is critical.

**Full paper: Scientific Reports, DOI:https://doi.org/10.1038/s41598-025-26489-w, Vol 15, Issue No. 1, 2025, pp 1-14.*

Analysis of Thermal and Dynamic Mechanical Properties of Epoxy Bio-Composites Reinforced with Sisal Fibers and Carbon Nanotubes

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ABSTRACT

The present study focuses on the fabrication and analysis of thermal and dynamic mechanical properties of epoxy bio-composites reinforced with 15 wt.% sisal fibers and varying carbon nanotube (CNT) content (0–2.0 wt.%). As per the results, incorporation of 1.0 wt.% CNT significantly enhances thermal and mechanical properties of the composite. Compared to the baseline composite without CNTs, thermal degradation onset has been improved by approximately 13%, while crystallinity and thermal resilience also increased. The storage modulus and loss modulus rose by approximately 79% and 197% respectively, indicating greater stiffness and energy absorption capacity. The damping factor (tan δ) decreased by over 56%, implying enhanced load-bearing capability with reduced energy dissipation. These improvements are attributed to better interfacial bonding and uniform CNT dispersion at 1.0 wt.%. The SEM analysis of epoxy bio-composites also revealed that the optimal dispersion and strong interfacial bonding are achieved at 1.0 wt.% CNT. Overall, the findings demonstrate that optimal thermal stability and viscoelastic properties occur at low CNT content in natural fiber composites, making them suitable for advanced structural applications in automotive, aerospace, and packaging sectors.

**Full paper: Scientific Reports, DOI: https://doi.org/10.1038/s41598-025-21546-w, Vol 15, Issue No. 1, 2025, pp 1-12.*

Effect of Magnesium Solubility in Eutectic Al–Si Matrix SiC Composites on the Mechanical Properties

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ABSTRACT

This study explores the combined influence of magnesium (Mg) alloy content (0–1.5 wt%) and silicon carbide (SiC) (0–4 wt%) on the mechanical and tribological properties of stir-cast Al–Si composites. The uniform dispersal of SiC within the alloy matrix is confirmed by the microstructural analysis, contributing to improved material properties. The mechanical characterization revealed that hardness and ultimate tensile strength (UTS) increased with the addition of Mg and SiC. Specifically, for unreinforced Al–Si composites, UTS values increased from 158.8 MPa to 191.3 MPa and further to 217.8 MPa as Mg content rose from 0 to 1.5 %. In SiC-reinforced composites, UTS improved significantly, reaching 207 MPa with 2 % SiC and 217.8 MPa with 4 % SiC at 1.5 % Mg. Wear tests conducted under varying loads (15–45 N) and speeds (150–450 RPM) demonstrated that wear rates consistently decreased with increasing Mg and SiC contents. These results emphasize the combined effect of Mg and SiC in significantly enhancing the wear resistance and mechanical properties of Al–Si matrix composites, making them appropriate for high-performance applications.

**Full paper: Journal of Materials Research and Technology, DOI: https://doi.org/10.1016/j.jmrt.2025.09.253, Vol 39, 2025, pp 2256-2263.*

Optimizing Solar Desalination Efficiency through Vacuum-Assisted Heat Exchanger Technology

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ABSTRACT

With the increasing demand for fresh water and the need for sustainable energy solutions, solar desalination technologies have emerged as a promising alternative. Traditional solar desalination systems often face challenges such as low evaporation rates, high-energy consumption, and slow desalination processes. This study aims to optimize solar desalination systems using vacuum-assisted heat exchangers. By applying a vacuum, the boiling point of water is reduced, which increases evaporation rates and accelerates the desalination process. The experimental setup involves circulating saline water through the vacuum chamber, where solar energy heats the water, promoting evaporation at lower temperatures. The evaporated water vapor is captured by a condenser unit and converted back to freshwater. The system's performance is evaluated under various conditions to identify optimal parameters. Data analysis, employing deep learning techniques such as convolutional neural networks (CNNs) combined with long short-term memory (LSTM) models, aims to refine operating conditions for maximum efficiency. Multivariate adaptive regression splines (MARS) will be integrated to model the nonlinear and complex relationships between these variables in a more interpretable and flexible way. The findings indicate that vacuum-assisted heat exchangers at 50 Torr significantly enhance evaporation rates to .15 $kg\,m^{-2}\,h^{-1}$ compared to traditional systems, achieving improved desalination performance. The study demonstrates the potential for substantial energy and cost savings while increasing sustainability in water purification processes. Future research will focus on scaling up the technology, improving material durability, and integrating advanced control systems for real-time optimization, offering potential solutions to global water scarcity issues.

**Full paper: Journal of Thermal Analysis and Calorimetry, DOI: https://doi.org/10.1007/s10973-025-15061-3, Vol 150, 2025, pp 21047-21066.*

Efficient Thermal Management of Hybrid Photovoltaic-Thermal Solar Panels using Phase Change Material for Industrial Applications

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ABSTRACT

This study presents a novel thermal management approach for hybrid photovoltaic-thermal (PVT) solar panels using phase change materials (PCMs) to enhance energy efficiency in industrial applications such as food processing, textiles, and chemicals. The research develops an adaptive system that integrates paraffin wax-based PCMs infused with graphene to regulate panel temperature, improving both electrical and thermal performance. Paraffin waxes with phase change temperatures between 40 °C and 70 °C and latent heat capacities of 150–200 kJ kg^{-1} were selected for their thermal stability, conductivity, and low cost. Laboratory and field tests evaluated various PCM formulations and configurations under controlled and real-world conditions. Key metrics, including temperature stability, electrical output, and thermal efficiency, were monitored using sensors and data loggers. Compared to conventional PVT systems, the PCM-enhanced panels demonstrated a 28% increase in thermal efficiency, a 15% rise in electrical output, and a 12 °C reduction in temperature fluctuation. These outcomes highlight the potential of PCM-integrated PVT panels to improve industrial energy efficiency and support sustainable operations.

**Full paper: Energy Technology, DOI:https://doi.org/10.1002/ente.202501489, 2025.*

Developing a Framework for Sustainable Engineering Education through Transformative Learning Principles

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ABSTRACT

Engineering education must evolve to prepare graduates as ethical, socially responsible, and sustainable designers responding to climate, resource, urbanization, and equity challenges, not just technical specifications. This paper examines sustainability in engineering education through the integrated lenses of transformative learning theory (TLT), triple bottom line (TBL), and education for sustainable development (ESD) to link pedagogy with measurable learning and impact. The research question guiding this study is stated once and consistently: In what ways do distinctive pedagogical approaches and curricular changes within engineering education facilitate transformative learning processes that develop students' sustainability competencies?. Using a mixed-methods design, the study analyzes fifteen qualitative case studies (curricular, co-curricular, outreach, industry/research) for evidence of disorienting dilemmas, critical reflection, and perspective transformation, and synthesizes quantitative indicators (participation, tangible outputs, composite Sustainability Impact Score) across five representative cases. Findings show that experiential, interdisciplinary, and community-engaged formats catalyze holistic TBL reasoning, ethics and stewardship, systems and critical thinking, and theory-to-practice application; technically intensive projects yield clearer measurable outcomes, while community initiatives benefit from stronger pre/post assessment. The integrated TLT–TBL–ESD model and the Sustainability Impact Score offer practical guidance for course design, faculty development, and institutional change aligned to WFEO 2030 competencies, supporting scalable, evidence-based transformation in engineering education.

**Full paper: Discover Sustainability, DOI: https://doi.org/10.1007/s43621-025-02146-0, Vol 6, Article No. 1473, 2025, pp 1-32.*

A Comparative Study on Diesel Engine Performance Characteristics with Hybrid Blended Biodiesels

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ABSTRACT

In the present comparative study, the biodiesel was produced from four non-edible seed oils sourced from Pongamia Pinnata, Scleropyrum Pentandrum, Calophyllum Inophyllum, Hevea Brasilensis Plants, and Waste Cooking Oil (WCO) from local hotels. The property of the biodiesel is determined by the fatty acid components of the base oil. When the fatty acid esters are formed, the individual fatty acid ester contributes to the overall fuel property of the biodiesel. If the physical property relationship is understood, then the desired quality biodiesel can be obtained by blending different proportions of fatty acid alkyl esters. Ultimately, the expected quality of biodiesel must perform the best in the engine. Based on this concept, the hybrid blends were prepared, and their important physical properties were compensated using a combination of biodiesels. To study the effect of hybrid blending, i.e., the internal mixing of biodiesels, a combination of hybrid blends with complementary fuel properties was obtained by mixing Pongamia (P100), Waste cooking oil (W100), Scleropyrum (S100), Calophyllum (C100), and Hevea (H100) biodiesels, referred to as PWSCH blends. The 10% and 20% individual and combination of these blends were investigated for engine performance, combustion, and emission characteristics on a single cylinder, four-stroke, direct injection, Compression Ignition (CI) Diesel Engine, and these data were compared with pure petroleum diesel characteristics. It was found that the hybrid blending technique can be applied to compensate for fuel properties, and a lower percentage of hybrid blends can be utilized in CI engines along with conventional biodiesel blends

**Full paper: International Journal of Mechanical Engineering, DOI: https://doi.org/10.14445/23488360/IJME-V12I11P106, Vol 12, Issue No. 11, 2025, pp 55-66.*

Social and Economic Impact of Sahaja Samrudha on Sustainable Agriculture in Karnataka

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ABSTRACT

This study investigates the role of Sahaja Samrudha, a social enterprise based in Karnataka, in encouraging sustainable agriculture and community development through a mixed-methods approach involving a survey of 62 custodian farmers. While demographic data such as age, gender, and education were collected, the primary focus was on assessing the broader social and economic impacts of the enterprise. The outcomes highlight Sahaja Samrudha's significant contributions to environmental sustainability, income enhancement, and the empowerment of marginalised groups, particularly women, through training and capacity-building initiatives. Despite these positive outcomes, the study identifies areas for development, notably in access to social services and education. Although the regional scope may limit broader applicability, the research provides valuable insights into the transformative potential of eco-social enterprises in advancing inclusive growth and sustainable development, emphasising the importance of supportive policies and resource allocation to amplify their impact across diverse contexts.

**Full paper: Journal of Social Entrepreneurship Theory and Practice, DOI: https://doi.org/10.31098/jsetp.v4i1.3284, Vol 4, Issue No. 1, 2025, pp 46-62.*

DEPARTMENT OF BUSINESS ADMINISTRATION

Enhancing Engineering Student Employability: A Predictive Analytics Approach to Academic Performance Skills Development and Placement Outcomes

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ABSTRACT

Purpose: Engineering education plays a crucial role in fostering innovation and technological advancements across industries. This study examines the impact of academic achievement on engineering placements, identifying key factors influencing students' organizational success. The research aims to enhance students' skills and competencies to improve their employability in preferred companies.

Design/methodology/approach: The study employs a data-driven approach, analyzing historical student placement records and applying predictive analytics to forecast future placement trends. A comprehensive evaluation of demographic, academic and skill-based factors is conducted to determine their influence on student employability outcomes.

Findings: The results highlight the complex relationship between academic performance, demographic factors and employability competencies. The study underscores the importance of a holistic education model that integrates technical knowledge with essential skills development. Insights from this research provide valuable guidance for educational institutions, policymakers and industry stakeholders in optimizing engineering curricula to enhance student placement success.

Originality/value: The novelty of this study lies in its multidimensional approach to analyzing student placement outcomes. By exploring the interplay between academic performance, demographic influences and employability skills, this research contributes to a more inclusive and equitable engineering education system. The findings serve as a foundation for future discussions, collaborations and strategic initiatives aimed at improving engineering students' transition into the workforce.

**Full paper: Higher Education, Skills and Work-based Learning, DOI: http://doi..org/10.1108/HESWBL-03-2025-0080, Vol 15, Issue No. 5, 2025, pp 1083-1097.*

Influencer Traits and Information Credibility in Driving Gen Z Women's Purchase Intentions

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ABSTRACT

Influencer marketing has evolved from a hobby into a key business strategy, as companies increasingly collaborate with influencers to promote their products. This shift is especially impactful for Generation Z, who rely heavily on social media to discover and follow the latest fashion and lifestyle trends. This study examines how YouTubers' influencer marketing impacts the credibility of information and influences purchasing decisions for cosmetic brands. Using a descriptive study design, 385 digitally active Gen Z participants were selected through snowball sampling, highlighting their significant role in shaping consumer trends. The study utilised Confirmatory Factor Analysis (CFA) to assess reliability and validity, while hypotheses were tested using Structural Equation Modelling (SEM). The study found that source-related factors like expertise (β= 0.216), trustworthiness (β=0.678), likability (β=0.287), and homophily (β=0.298) positively and significantly influence perceived information credibility. However, platform factors like social advocacy and interactivity had no significant impact, while argument quality negatively influenced information quality. Ultimately, perceived information credibility significantly influences purchase intentions (β=0.564) for beauty products among Generation Z women in India. The study's results are in partial agreement with previous research, shedding light on how Generation Z women engage with social media content when seeking recommendations for beauty products.

**Full paper: International Journal of Accounting and Economics Studies, DOI: http://doi.org/10.14419/vh2af397, Vol 12, Issue No. 5, 2025, pp 1207-1216.*

Routing TQM through HR Strategies to Achieve Organizational Effectiveness: The Mediating Role of HR Outcomes in India

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ABSTRACT

Purpose: The present research focuses on improving the awareness related to soft total quality management (TQM) practices by looking from the viewpoint of strategic human resources (HR). In addition, it is intended to reflect on the resulting soft TQM-HR outcomes and determine the mediating effect between soft TQM-HR strategies and organizational effectiveness (OE).

Design/methodology/approach: An exploratory research methodology with an online survey technique was adopted for the study. Three hundred and three managerial-level personnel from nine large Indian manufacturing organizations participated in the research. A theoretical model is projected and verified using correlation and mediation analysis.

Findings: The results show that commitment, reduced turnover intentions and satisfaction levels of employees mediate the relationship between resources, development and retention strategies and OE. However, the retention strategy has the strongest association with the OE of the three strategies. Also, of the three HR outcomes, satisfaction was strongly associated with OE. The analysis proved that the proposed model is an acceptable fit.

Practical implications: Implementing HR-related TQM strategies will likely impact OE since it elicits positive HR outcomes such as commitment, reduced turnover intention and satisfaction. Recognizing human resources as a unique strategic asset will help HR managers devise adequate resourcing, development and retention strategies instrumental in executing TQM.

Originality/value: The present micro study is unique in scrutinizing the influence of soft TQM-HR practices on organizational effectiveness by analysing the mediating effects of commitment, reduced turnover intention and satisfaction in Indian large-scale manufacturing organizations. The study is unique since no literature deciphers the linkages between HR strategies and organizational effectiveness in the Indian manufacturing sector.

**Full paper: The TQM Journal, DOI: http://doi.org/10.1108/TQM-05-2023-0138, Vol 37, Issue No. 2, 2025, pp 289-318.*

Arbitrage Opportunities in the Energy Equity Futures-A study from Indian Perspective

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ABSTRACT

This study aimed to examine the opportunity for arbitrage in Indian energy equity futures. Contract-wise historical spot and futures data were gathered for ten selected energy companies. The cost of carry model was used to compute the theoretical values of the futures. To generalize the results, the T-test was applied, and the run test was used to assess the randomness of the arbitrages during the contract period. The T-test results revealed that, after factoring in brokerage and taxes, most of the selected companies' arbitrage values were not equal to zero. The results of the test indicated that the arbitrage opportunities were not random during the contract period; they are highest at the beginning of the contract and gradually decrease as the delivery date approached. This study serves as a valuable reference for the traders, investors, and policymakers in the Indian market.

**Full paper: Multidisciplinary Science Journal, DOI:https://10.31893/multiscience.2025067, Vol 7, Issue No. 1, 2025.*

Social Media as a Catalyst for Women Entrepreneurs: Scaling Small Businesses in the Digital World

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ABSTRACT

This paper intends to examine the extent to which women entrepreneurs of small-scale business have digitized their business using social media in this digital era of industry 4.0. Nature of this study is Qualitative. Exploratory in-depth interview method was used for data collection. 10 women entrepreneurs from various industries were interviewed. This study contributes with new insights regarding women entrepreneurs' behavior and approach towards digital upskilling, practical learning, entrepreneurial training. Results of the study show that cheap availability of technology, convenience, ease of use are the compelling reasons for digitization of business. On the contrary, limited resources, continuous growth of technology, the need for consistent learning of new skills, stress, work life balance are the other factors that hinder the digital adoption of business. This study provides understanding between women entrepreneurship, business and technology adoption with social media as a catalyst. Presently in Industry 4.0 era, socially relevant business, innovative methods for doing a business are gaining momentum. In this digitally cluttered environment, it is vital for women entrepreneurs of small-scale business to unlearn, learn and relearn technology and implement in their ventures to make their business successful.

**Full paper: Sustainable Data Management, Studies in Big Data, DOI: https://doi.org/10.1007/978-3-031-83915-3_49, Springer, Vol 170, 2025, pp 601-610.*

Empowering Skill Development: A Dual Perspective on Revitalizing Student Engagement

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ABSTRACT

The present study aims to address the urgent requirement for improving student involvement within the context of classroom teaching. This study covers a broad range of novel methods and methodologies with the objective of promoting a more dynamic and participatory learning environment. This study presents a comprehensive examination of pedagogical approaches that incorporate active learning strategies, and flipped classroom models. The study is a comprehensive analysis to understand the impact of active learning strategies like role play, flipped classroom, mind mapping, newspaper analysis and case study implemented on the various skillsets (Creative thinking, Interpersonal communication, Self-paced learning, Team building, Decision making) of students. For the study 180 number of students were chosen from UG and PG courses. The findings revealed that the varied active learning strategies are having varied impact on the student's skillset. This study is a significant resource for educators, curriculum creators, and educational policymakers who aim to adapt and enhance their instructional practises to effectively address the changing demands of engineering students in the current dynamic educational environment.

**Full paper: Sustainable Data Management, Studies in Big Data, DOI: https://doi.org/10.1007/978-3-031-83915-3_48, Springer, Vol 170, 2025, pp 589-600.*

Dynamics of Return and Volatility Interactions between Exchange Rates and NSE Sectoral Indices: A Comparative Analysis Pre and Post COVID-19 Pandemic

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ABSTRACT

This paper investigates the dynamics of return and volatility spillover effects between exchange rates and National Stock Exchange (NSE) sectoral indices, with a focus on the distinct periods before and after the outbreak of the COVID-19 pandemic. By employing the robust Dynamic Conditional Correlation GARCH (DCC-GARCH) model, this study assess relationship between these critical financial indicators. Empirical analysis is carried out using daily return data of USD/INR exchange rate and NSE sectoral indices, spanning both the pre-pandemic and post-pandemic eras ranging from 1st January 2018 to 31st October 2023. The DCC-GARCH model is applied to capture the time-varying correlations and conditional volatilities within these datasets. The findings of the study revealed that in short run there is a spillover effect from exchange rates to Indian stock markets. Investors must be cautious to invest in the Indian stock market for the long period of time as there is volatility spillover or volatility transmission observed in few sectors of NSE post covid.

**Full paper: Sustainable Data Management, Studies in Big Data, DOI: https://doi.org/10.1007/978-3-031-83911-5_37, Springer, Vol 171, 2025, pp 426-436.*

Volatility Spillover Effects between Indian Textile Companies and Exchange Rate: A BEKK-GARCH Analysis

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ABSTRACT

The paper investigate the volatility spillover of Exchange rate and Nifty index returns to the selected stocks of Indian textile sector. Understanding the volatility spillover is very important in determining the portfolio risk and for policy making. The data for the period spanning from 01-04-2013 to 31-03-2023 of USD/INR exchange rate, NSE Nifty and selected five stocks of Textile Sector namely PAGE Industries Ltd., KPR Mills Ltd., Trident Ltd., Raymond Ltd. and Welspun Ltd. were used for the study. By applying the Multivariate BEKK GARCH model, the study analyzed the variance and covariance fluctuations of volatility returns concerning exchange rates. Nifty and stock returns using Multivariate BEKK-GARCH model. A bi-directional spillover has been found between exchange rates and Stock returns. The study also provides the proof of existence of positive conditional correlations among the variables.

Full paper: Sustainable Data Management, Studies in Big Data, DOI: https://doi.org/10.1007/978-3-031-83911-5_17, Springer, Vol 171, 2025, pp 195-206.

The Effect of Post-Merger Technological Integration on Customer Satisfaction and Continuance Intention in the Indian Banking Sector

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ABSTRACT

Purpose: This study investigates the influence of mergers and acquisitions (M&As) in the Indian banking sector, with a specific focus on technological transformations and their effects on customer satisfaction and continuance intention (CI). By applying the expectation-confirmation model (ECM), the study explores how customer expectations influence post-merger experiences, particularly in relation to trust and retention.

Design/methodology/approach: A quantitative research design was employed, using structural equation modeling (SEM) to analyze responses from 398 banking customers who experienced service transitions following recent bank mergers. The model examines the relationships among expectation confirmation (EC), perceived usefulness (PU), satisfaction, trust and CI.

Findings: The results present that EC significantly affects both PU and customer satisfaction. These in turn influence trust and CI, highlighting the central role of technological adaptation in shaping customer experiences post-merger.

Practical implications: The findings highlight the importance of strategic change management, transparent communication and customer-focused digital integration during mergers. Banking institutions should prioritize the implementation of user-friendly technologies, provide timely and clear information, and guarantee robust support systems to foster trust and reduce service disruptions. These efforts can lead to higher customer retention and persistent brand loyalty in a competitive banking environment.

Originality/value: This study extends the application of the ECM to the context of banking mergers, shifting the focus from financial and operational outcomes to the customer experience. It provides empirical evidence on how technological transitions impact customer satisfaction and retention, offering valuable insights for both academic research and industry practice.

**Full paper: Journal of Economic and Administrative Sciences, DOI: https://doi.org/10.1108/JEAS-04-2025-0236, 2025, pp1-16.*

Evaluation of Short-Run Performance of Indian IPOs

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ABSTRACT

The Indian business landscape is experiencing a surge in companies choosing Initial Public Offerings (IPOs) to go public. The promise of substantial capital acquisition and growth opportunities drives this trend. This study analyzes the post-IPO performance of various companies that went public between 2018 and 2022 using event study methodology. It also examines whether these IPOs were underpriced in the short term and identifies the factors influencing their shortterm movements. The study found that approximately 70% of the selected IPOs were underpriced in the short term, and the company's age did not influence their short-term movements, the IPO's issue size, the ownership sector, or the promoter's holdings after the issue

Full paper: Anveshana, Vol 14, Issue No.2, 2025, pp 62-75.

Smart Manufacturing: A Strategic Pathway to India's $5 Trillion Economy

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ABSTRACT

India has set an ambitious target of becoming a $5 trillion economy in the coming years, with manufacturing positioned as one of the key drivers of growth. Smart manufacturing, driven by Industry 4.0, new technologies such as the Artificial Intelligence (AI), Internet of Things (IoT), Robotics, Additive Manufacturing, and Big Data Analytics, has the potential to transform India's industrial ecosystem. This paper examines the role of smart manufacturing in accelerating India's journey toward a $5 trillion economy, explores case studies from Indian industries, and highlights policy enablers, challenges, and future pathways. The findings suggest that integrating technology, human capital development, and sustainable development practices will not only enhance competitiveness but also contribute to inclusive economic growth and long-term resilience.

**Full paper: The Academic-International Journal of Multidisciplinary Research, DOI : https://doi.org/10.5281/zenodo.17303159, Vol 3, Special Issue No. 1, 2025, pp 332-338.*

DEPARTMENT OF COMPUTER APPLICATIONS

Harnessing LSTM Networks for Effective Speech Emotion Recognition

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ABSTRACT

The inability to achieve the desired performance in a correct identification of expressed emotions by using machine learning algorithms sometimes poses challenges for applications like customer service and aviation safety. In this paper, a real-time Speech Emotion Recognition (SER) system based on the LSTM network that recognizes emotion from audio input is introduced. The dataset includes 1,440 audio recordings with emotions such as calm, happy, sad, fear, disgust, surprise, and neutral. Key to methodology are the selection of a reliable database for emotional speech, feature extraction, such as Melfrequency cepstral coefficients (MFCC), and development of an effective LSTM model. The basic idea behind the model is to enable improved human-computer interaction through the understanding of vocal input analysis and classification so that the system can classify emotions. The proposed study improves emotion recognition accuracy with an overall accuracy ranging around 82.2%. This development is significant, not just in terms of the improvement it brings about in computational linguistics, but it will have practical applications trying to make improvements in user experience with regard to diverse domains, such as customer service and support for mental health services. The future work is mainly aimed at further increasing model accuracy and expanding its capabilities in recognizing other emotions.

Full paper: International Conference on Advances in Modern Age Technologies for Health and Engineering Science (AMATHE) , *DOI: 10.1109/AMATHE65477.2025.11081302, Shivamogga, 24-25 April 2025.*

A Survey on Cyber Security: Elements, Parameters, and Ethical Considerations

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ABSTRACT

Cybersecurity has evolved as a pivotal discipline in the digital age, defending systems, networks, and data from threats that can result in data breaches, financial losses, and damage to reputation. This survey aims to provide a comprehensive overview of the core elements and parameters defining cybersecurity and the ethical concerns associated with it. The foundational elements such as confidentiality, integrity, and availability (CIA triad), along with authentication, authorization, and non-repudiation, are analyzed. Furthermore, key parameters including risk management, threat modeling, vulnerability assessment, and incident response are discussed in detail.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI:10.15680/IJMRSET.2025.0806010, Vol 8, Issue No. 6, 2025, pp 9497-9502.*

Convolutional Neural Networks for Food Image Recognition and Classification

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ABSTRACT

This research addresses the challenge of classifying food images, which are prevalent on social media but often disorganized. Using convolutional neural networks (CNNs), was explored both training from scratch and transfer learning with pre-trained models. Employing the Food-101 dataset, was tested several models, including AlexNet, VGG16, ResNet50, and InceptionV3.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI:10.15680/IJMRSET.2025.0806011, Vol 8, Issue No. 6, 2025, pp 9503-9506.*

Streamlining Project Development with DevOps: Enhancing Efficiency and Collaboration

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ABSTRACT

The integration of DevOps techniques into project development has revolutionized the way software is delivered, emphasizing efficiency, collaboration, and continuous improvement. By incorporating Infrastructure as Code (IaC), monitoring tools, and continuous integration and delivery (CI/CD) pipelines, DevOps teams can automate workflows and foster a collaborative atmosphere, effectively bridging the gap between development and operations. This approach ensures frequent, reliable, and rapid software delivery while maintaining high standards of quality and stability. By reducing development times and increasing deployment frequency, DevOps practices enhance team productivity and enable continuous feedback and enhancement, ensuring that projects adapt effectively to evolving client needs. The tools used in implementing these practices include various CI/CD platforms, IaC tools, and monitoring tools. Specifically, automated deployment algorithms and configuration management algorithms play crucial roles in maintaining system consistency and ensuring efficient resource management. Our implementation plan focuses on automating builds and deployments using CI/CD, managing infrastructure through IaC, and employing monitoring tools for real-time system tracking. By fostering collaboration between development and operations teams and ensuring continuous feedback, we aim to create a dynamic and responsive project development environment that can quickly adapt to changes and deliver high-quality software solutions.

Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI:10.15680/IJMRSET.2025.0806012, Vol 8, Issue No. 6, 2025, pp 9507-9513.

Impact of Online Platforms on Pet Industry

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ABSTRACT

This paper looks at how online platforms, such as e-commerce websites, social media, and service directories, have changed the pet industry. By examining recent trends and studies, it explores how these digital tools have changed how people shop for pet products, expanded market reach, and introduced new ideas in the pet world.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI: 10.15680/IJMRSET.2025.0806013, Vol 8, Issue No 6, 2025, pp 9514-9516.*

Comparative Analysis of Heart Disease Prediction using Machine Learning Algorithms

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ABSTRACT

Day by day the cases of heart diseases are increasing and it's very Important and concerning to predict any such diseases beforehand. So, there is a need for accurate, and feasible system to diagnose such diseases in time for proper treatment. In the last ten years, heart disease has become a leading cause of death worldwide. Heart Disease is an illness that affects many lives, is severely life-threatening, and can weaken a person's ability to live a conventional life. The reasons for heart disease are many, predicting makes it complicated. Here we have used Machine Learning algorithms to predict the accuracy of heart disease. Our objective is to use Machine Learning to ease the prediction of heart disease. Here several sets of data sets have been used on many machine learning algorithms. Here are some of the proposed algorithms that have been tested: Logistic Regression, Random Forest, Support Vector, KNN and Naive Bayes. After rigorous testing Logistic Regression, Random Forest and Naive Bayes stayed dominant in most of the testing achieving accuracies of 85.25% and KNN, Support Vector with the accuracy rate of 63.93% and 68.85%. As shown in this paper, Machine Learning is a prominent tool to predict Heart Disease, and results can be further improved with the help of medical professionals and more research

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI:10.15680/IJMRSET.2025.0806014, Vol 8, Issue No. 6, 2025, pp 9517-9522.*

Meta's LLaMA2 AI: Impact on Radiology, Finance and Beyond

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ABSTRACT

Artificial Intelligence models like OpenAI's ChatGPT and Google's Gemini have already left an impression in various fields through practical application. Ever since the release, there has been a significant rise in the development and deployment of models. Meta's LLaMA is among the few models that have been coming onto the rise to operate on standalone machines. It also has been already researched and deployed in radiology and finance. Although limited by the information due to lack of internet connectivity, it rivals its online counterparts. This research paper focuses on the extent of this model, i.e., its limitations and fields of use.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI: 10.15680/IJMRSET.2025.0806015, Vol 8, Issue No. 6, 2025, pp 9523-9526.*

The Potential for AI in Healthcare

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ABSTRACT

The complexity and rise of data in healthcare means that artificial intelligence (AI) will increasingly be applied within the field. Several types of AI are already being employed by payers and providers of care, and life sciences companies. The key categories of applications involve diagnosis and treatment recommendations, patient engagement and adherence, and administrative activities. Although there are many instances in which AI can perform healthcare tasks as well or better than humans, implementation factors will prevent large-scale automation of healthcare professional jobs for a considerable period. Ethical issues in the application of AI to healthcare are also discussed.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI:10.15680/IJMRSET.2025.0806016, Vol 8, Issue No. 6, 2025, pp 9527-9531.*

Artificial Intelligence and Ethics Navigating the Future of AI

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ABSTRACT

As artificial intelligence (AI) continues to evolve and permeate various aspects of society, the ethical implications of its development and deployment become increasingly significant. This discussion explores the multifaceted ethical challenges associated with AI, including issues of bias, privacy, accountability, and the potential for job displacement. It examines the impact of AI on decision-making processes, societal norms, and human values, emphasizing the need for responsible AI development that aligns with ethical principles. The discussion also highlights frameworks and guidelines for ethical AI practices, exploring how policymakers, technologists, and stakeholders can collaborate to ensure that AI systems are designed and implemented in a manner that promotes fairness, transparency, and societal well-being. Navigating the future of AI requires a nuanced understanding of these ethical considerations to foster innovations that benefit humanity while mitigating potential risks. As artificial intelligence (AI) continues to advance and integrate into daily life, its ethical implications become crucial. This discussion delves into the ethical challenges of AI, such as bias, privacy concerns, accountability.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI:10.15680/IJMRSET.2025.0806017, Vol 8, Issue No. 6, 2025, pp 9532-9535.*

Plant Health Monitoring and Management using Iot

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ABSTRACT

Internet of Things (IoT) technologies offers innovative solutions for plant health monitoring and management in urban agriculture. This study explores the deployment of IoT sensors to continuously monitor essential environmental parameters, including soil moisture, temperature, humidity, and light intensity, as well as plant health indicators such as leaf moisture and nutrient content. Through real-time data collection and advanced analytics, the system enables early disease detection, optimized irrigation, and precise nutrient management. The approach aims to enhance resource efficiency, improve crop yields, and support sustainable farming practices. By providing actionable insights to urban farmers, this research highlights the transformative potential of IoT in addressing the challenges of urbanization and increasing demand for locally sourced food, contributing to local food security and sustainable food production.

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Enhancing Blockchain Scalability and Transaction Throughput

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ABSTRACT

Blockchain, a distributed ledger technology, forms a distributed consensus on a history of transactions and is the foundational technology for Bitcoin and other cryptocurrencies. Its applications also extend beyond the financial sector. The transaction verification process for cryptocurrencies is slower compared to traditional digital transaction systems. This paper proposes a method to enhance scalability by accelerating the Proof of Work process through parallel mining instead of solo mining. The aim is to prevent multiple miners from duplicating efforts on solving the same block. The proposed method involves selecting a manager and distributing work among miners. The method has been implemented in a test environment and tested with various scenarios by altering the difficulty level and number of validators. Results also show the feasibility of the proposed method.

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Whisperwave: Exploring the Potential of Silent Sound Technology

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ABSTRACT

Silent Sound Technology, showcased at the 2010 aims to detect lip movements and convert them into audible sounds. This technology has the potential to aid individuals who have lost their voice, enabling them to communicate, and allows for silent phone calls without disturbing others. While effective for languages such as English, French, and German, this technology faces challenges with tonal languages like Chinese. Silent Sound Technology offers a wide range of applications, from assisting those who have lost their voice due to illness or injury to securely transmitting sensitive information, such as PIN numbers, over the phone without the risk of eavesdropping. The keyword that contain deep learning, lip movement detection, assistive technology, secure communication. machine learning, data visualization.

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Digital Transformation and its Impact on Employee Engagement and Productivity

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ABSTRACT

This paper delves into the impact of digital transformation on employee engagement and productivity. Digital transformation, encompassing the adoption of advanced technologies such as AI, cloud computing, and data analytics, has redefined workplace dynamics. The study explores how these technologies influence employee engagement and productivity by facilitating better communication, streamlined processes, and enhanced decisionmaking capabilities. Through a comprehensive review of existing literature and case studies, this paper highlights the benefits and challenges associated with digital transformation. It also examines the strategies organizations can adopt to maximize the positive effects of digital transformation while mitigating potential drawbacks. The conclusion provides insights into the future trajectory of digital workplaces, emphasizing the importance of balancing technological advancements with human-centric approaches.

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Developing AI-Powered Personal Training Applications

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ABSTRACT

Artificial Intelligence (AI) is poised to revolutionize personal training in gym settings by integrating wearable sensors with advanced AI algorithms. These innovative applications deliver bespoke training plans, continuously monitor real-time performance metrics, and provide instant feedback to users. They meticulously track key fitness parameters such as heart rate, calorie expenditure, and exercise form, employing sophisticated analysis to optimize workout routines. Through personalized exercise plans tailored to individual goals and fitness levels, AI systems enhance training effectiveness and predict future performance trends, contributing to injury prevention and overall fitness improvement. This redefines the gym experience, ensuring every workout is efficient, effective, and personalized to maximize results.

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The Future of Autonomous Vehicles and Transportation Systems

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ABSTRACT

The advent of autonomous vehicles (AVs) heralds a transformative era in transportation, promising increased safety, efficiency, and accessibility. Leveraging deep learning, sensor fusion, and real-time data analytics, AVs are poised to reduce human error, which is a leading cause of accidents. Autonomous technology also enables optimized traffic flow and reduced congestion through intelligent route planning and vehicle-to-vehicle (V2V) communication. However, challenges persist, including regulatory hurdles, cybersecurity risks, and the integration of AVs into existing infrastructure. Additionally, ensuring the reliability of AV systems in diverse weather conditions and complex urban environments remains a critical focus area. The future of transportation will likely witness a seamless blend of AVs with smart city infrastructure, enhancing public transit systems, and paving the way for sustainable, ecofriendly mobility solutions. From personalized ride-sharing services to autonomous freight transport, the implications are vast, driving a paradigm shift in how we perceive and utilize transportation networks.

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Touchless Touchscreen Technology using GBUI

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ABSTRACT

The first catalyst was touch screens. Gone are the days of touch screen and scratching them up. To avoid repeated touching of the touchscreen display with a pointing device such as a finger, a simple control method has been developed for Touchless control of electrically operated machines. Elliptic Labs' technology allows for touchless control of devices such as computers, MP3 players and mobile phones. The touchscreen display gives the user more flexibility, but after a few years, the touchscreen display becomes less sensitive, resulting in touch failure on the touchscreen display. To avoid this problem, a simple method has been developed for touch Free control of electrically driven devices.

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From Monolith to Microservices: Docker's Role in Modernization

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ABSTRACT

The transition from monolithic applications to microservices architecture represents a pivotal shift in software development driven by the need for scalability, agility, and maintainability. Docker, a leading containerization technology, facilitates this transformation by providing lightweight, portable containers that encapsulate everything needed to run an application. This paper explores Docker's role in decomposing monolithic systems into loosely coupled microservices. Through a thorough review of literature and case studies, the research highlights the benefits, challenges, and best practices associated with adopting Docker for microservices. The findings underscore Docker's pivotal role in enabling organizations to achieve greater flexibility and efficiency in software development, thereby supporting their transition towards modern, scalable software architectures.

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Elastic Quotas: Dynamic Resource Management in Cloud Computing

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ABSTRACT

In the rapidly evolving landscape of cloud computing, efficient and dynamic resource management is paramount for optimizing both performance and cost. Traditional static resource allocation methods often lead to either underutilization or overprovisioning, thus incurring unnecessary costs or performance bottlenecks. This paper introduces the concept of elastic quotas as a dynamic resource management strategy in cloud environments. Elastic quotas enable real-time adjustment of resource allocations based on current demand, ensuring optimal utilization and cost-effectiveness. Through comprehensive simulations and experimental analysis, we demonstrate that elastic quotas significantly improve resource utilization and reduce operational costs compared to conventional static and autoscaling methods. The findings highlight the potential of elastic quotas to enhance the efficiency and scalability of cloud services, making them an essential tool for modern cloud infrastructure management.

Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI: 10.15680/IJMRSET.2025.0806026, Vol 8, Issue No. 6, 2025, pp 9585-9592.

The Influence of Solid Principles on Developer Onboarding and Knowledge Transfer in Large Teams

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ABSTRACT

Efficient onboarding and effective knowledge transfer are essential for the success of large software development teams. This study explores the effect of SOLID principles on developer onboarding and knowledge transfer. Through a combination of case study analysis and surveys, we assess how these principles influence code readability, modularity, and team collaboration. The results demonstrate that adherence to SOLID principles result in a more structured codebase, eases the learning curve for fresh developers, and improves documentation clarity, thereby enhancing knowledge transfer. This paper outlines the methodology, findings, and practical implications for adopting SOLID principles in large teams.

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Responsive Web Design and Cross Platform Compatibility

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ABSTRACT

As mobile technology rapidly evolves, using responsive and adaptive design methods has become essential to ensure applications work well on various devices and screen sizes. This thesis looks at Responsive Web Design (RWD) and cross-platform development frameworks. It also examines a mobile learning system built with HTML5 and RWD, proving its effectiveness across different platforms. The study surveys 181 industry professionals to understand the benefits and challenges of responsive design, including user experience and accessibility issues, as well as browser compatibility and loading times. It reviews HTML5 features like multimedia and storage and their support on major mobile systems. By creating and testing a PhoneGap application, the research shows that cross-platform development is effective but involves a trade-off between performance and ease of development. The study suggests adopting a broader concept called Responsive Application Design to better reflect these advancements.

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Artistic Innovation through AI Exploring AI-Generated Art Music and Literature

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ABSTRACT

This paper examines the transformative effect that Artificial Intelligence, and machine learning, have on art, music, and literature. AI technologies in general including machine learning and neural networks have proven extremely competent at creating creative works; arguably rivalling the output of some humans. The present study is a deep exploration of the mechanisms and methodologies through which AI produces art, music, or language poetrywith respect to their implications on innovativeexpressions in the future. This paper undertakes a review of existing literature and methodologies, mapping out the potential opportunities and challenges natural to AI integration in the creative industries. This paper breaks down the results of diverse works generated by AI and discuss their broader ramifications for artists, musicians, writers, as well as our society.

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Digital Payment in E-Commerce using AES Algorithm

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ABSTRACT

The Era of Information and Communication Technology (ICT) and digital innovation lead to dynamic changes in the business environment, where business transactions continue to shift from cash-based transactions to electronic-based transactions. The e-payment system was not introduced to replace cash but as a better alternative to cash and trade barter. Electronic payments can be understood as a payment mechanism using electronic media that does not involve cash. Electronic payment system (e-payment) is an important aspect of e-commerce.

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The Future of Digital Currencies: Exploring the Impact of Cryptocurrencies in Financial Institutions

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ABSTRACT

The rapid evolution of digital currencies has marked a significant shift in the financial landscape, with cryptocurrencies emerging as a disruptive force in traditional financial systems. This research explores the adoption of cryptocurrencies within financial institutions, analyzing the potential benefits, challenges, and implications for the broader financial ecosystem. Through a comprehensive literature survey, the study examines the historical context and technological advancements that have paved the way for cryptocurrency integration. Methodologically, the research employs qualitative and quantitative analyses to evaluate the adoption trends, regulatory frameworks, and the impact on financial stability and inclusion. The findings reveal a growing interest among financial institutions in leveraging blockchain technology to enhance transaction efficiency, security, and transparency. However, the study also highlights significant hurdles, including regulatory uncertainties, cybersecurity threats, and the volatility of digital assets. The implementation phase discusses real-world case studies of financial institutions that have integrated cryptocurrencies, shedding light on their strategic approaches and outcomes. The research concludes by outlining the future trajectory of digital currencies in financial institutions, emphasizing the need for robust regulatory policies, technological innovation, and stakeholder collaboration to harness the full potential of cryptocurrencies in reshaping the future of finance.

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AI-Powered Personalization in Fashion E-Commerce

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ABSTRACT

This study explores the dynamic relationship between AI and e-commerce, focusing on how AI-driven innovations are changing customer relationships and business practices Examines emerging issues in AI for ecommerce, such as data protection, security, and ethics. Research also addresses challenges such as data quality, complex algorithms, and scalable AI solutions. Future strategies include improving AI algorithms for better translations, increasing personalization, and increasing supply chain sustainability. Overall, the study provides insight into the evolution of AI-influenced e-commerce, providing valuable information for businesses, academics, and policymakers aiming to implement AI are responsible in today's e-commerce.[1]

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Intelligent Task Management: AI Solutions for Optimized Workflow

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ABSTRACT

Artificial Intelligence (AI) has transformed various sectors by enhancing efficiency and decisionmaking processes. In task management, AI solutions are increasingly utilized to streamline workflows and optimize performance. This paper focuses on intelligent task management systems powered by AI, examining their capabilities, impact on productivity, and the challenges faced in their implementation. By analyzing existing AI models and their applications in task management, the research aims to highlight the benefits, limitations, and potential improvements for AI-driven task management systems.

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Data Mining in Healthcare

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ABSTRACT

Data mining has emerged as a powerful tool in the field of healthcare, revolutionizing how vast volumes of patient data can be analysed and transformed into valuable insights. These abstract highlights the significance of data mining in the healthcare sector, exploring its potential to improve patient outcomes, optimize healthcare processes, and advance medical research. The healthcare industry generates a large amount of data, encompassing patient records, medical imaging, electronic health records, clinical trials and more. Data mining techniques offer a solution by leveraging advanced algorithms to sift through complex datasets and discover valuable knowledge.

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AI-Driven Personalization: Enhancing User Engagement through Intelligent Strategies in Social Media Platform

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ABSTRACT

The advent of artificial intelligence (AI) has revolutionized various aspects of digital communication, particularly within social media platforms. AI-driven personalization has emerged as a transformative approach, tailoring user experiences to individual preferences and behaviors, thereby enhancing engagement and interaction. This paper explores the diverse AI- powered personalization strategies, evaluating their effectiveness in fostering user engagement and satisfaction. It examines practical applications, challenges, and future directions in this evolving field. By reviewing current AI models, their implementations, and real-world case studies, the research underscores the significant impact of AI on social media interactions and highlights opportunities for further development.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI:10.15680/IJMRSET.2025.0806035, Vol 8, Issue No. 6, 2025, pp 9636-9641.*

Privacy Preserving in Big Data

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ABSTRACT

The necessity for privacy protection in big data analytics is growing due to the massive data collection and processing involved. This paper examines privacy-preserving methods, focusing on Differential Privacy, data anonymization, homomorphic encryption. Through comprehensive research and case studies, the effectiveness of these techniques in maintaining data privacy while preserving data utility is demonstrated. The study underscores the importance of privacy preservation to mitigate the risks of data breaches in big data analytics. The findings highlight the balance these methods achieve between privacy and utility, ensuring robust data protection. Future research directions are also suggested to enhance these privacy-preserving frameworks further.

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Exploring Cloud Computing Services and Applications

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ABSTRACT

Cloud computing provides a great flexibility and availability of computing resources at a lower cost. This emerging technology opens a new era of e-services in different disciplines. In this paper, we explore cloud computing services and applications, offering examples of services provided by the most common Cloud Service Providers (CSPs) such as Google, Microsoft, Amazon, HP, and Salesforce. We present innovative applications of cloud computing in elearning, Enterprise Resource Planning (ERP), and e- governance. Our study helps individuals and organizations understand how cloud computing can provide them with customized, reliable, and cost- effective services in a wide variety of applications.

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Safety and Security Measures in Car Rentals System

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ABSTRACT

Traditional car rental systems are often cumbersome for both consumers and rental companies due to their manual and time-consuming processes. This work proposes an innovative car rental system that integrates mobile app administration with IoT technology to streamline the process and enhance user experience. The system comprises an e-commerce platform that facilitates online vehicle rentals, payments, and user reviews. It also includes an IoTpowered feature to help car owners quickly identify incidents involving rented vehicles. A Google survey revealed strong support for this approach, with 96% of users and 100% of vehicle owners favoring the use of a mobile app for car rentals and the installation of advanced tracking and monitoring systems in rental cars. Future developments will include real-time monitoring using IoT technology to ensure rental compliance, monitor vehicle maintenance needs, and locate stolen vehicles. This proposed system aims to make car rental services more convenient and secure.

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Prospects of Quantum Computing and its Applications

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ABSTRACT

Quantum computing is an emerging field with the potential to revolutionize various aspects of science, technology, and society. By leveraging the principles of quantum mechanics, quantum computing aims to solve complex problems that are beyond the reach of classical computers. This research paper examines the future of quantum computing and its potential applications. It explores the foundational principles of quantum mechanics and highlights the challenges involved in developing practical quantum computers. Through an evaluation of recent advancements and ongoing research initiatives, this study provides insights into the future prospects of quantum computing and its transformative impact on multiple industries. The paper delves into the current state of quantum computing, its fundamental principles, and the potential applications that could reshape industries ranging from cryptography to drug discovery. Additionally, it addresses the challenges that need to be overcome and discusses the future outlook of this burgeoning technology

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Enhancing Construction through Virtual Reality

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ABSTRACT

The construction industry is adopting new technologies in all segments to enhance productivity, safety, and project quality. From these new technologies, virtual reality is undoubtedly one of the most disruptive tools, thus providing a highly immersive experience through interactive simulations. The paper will talk about how VR can enhance several aspects of construction processes, from design and planning through to training and project management. It enables the three-dimensional visualization of structures that are normally complex, helping stakeholders to forefront challenges and optimize workflows. This study is concerned with the current applications of VR in the construction industry and analyzes its impacts on reducing errors, improving communication, and enhancing safety protocols. The paper further discusses the challenges of integrating VR into existing construction practice and future potential for this technology to drive innovation in the industry. The results implied that VR not only enhances efficiency and effectiveness in construction projects, but may also play a very important role in shaping the future of the built environment.

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Mobile SMS Spam Detection with Bayesian Classifiers

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ABSTRACT

The abundance of unwanted spam messages com- plicates the use of Short Message Service (SMS) for efficient communication in modern times. This study investigates devel- oping and utilizing a Naive Bayes Theorem-based Ham/Spam detection system. Because of its ease of use and effectiveness in text classification tasks, the Naive Bayes classifier is used. A collection of SMS messages labeled as ”spam” or ”ham” (non- spam) makes up the dataset that was used for testing and training. Preprocessing methods, including tokenization, stop- word elimination, and stemming, are employed to extract pertinent features from the text messages. The Naive Bayes classifier learns how words relate to whether they’re in a spam or non-spam message by looking at some examples from the dataset. Utilizing criteria such as accuracy, precision, and confusion matrix on a separate testing set, the classifier’s performance is evaluated. Additionally, the impact of varying parameters such as smoothing techniques and feature selection methods on the classifier’s performance is analyzed. The experimental results used to distinguishing between ham and spam messages in SMS communication.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI:10.15680/IJMRSET.2025.0806041, Vol 8, Issue No. 6, 2025, pp 9734-9740.*

Sentiment Analysis of Covid-19 Lockdown in India

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ABSTRACT

The COVID-19 pandemic has resulted in unparalleled worldwide alterations, encompassing lockdowns in numerous nations. A national lockdown was implemented in India in March 2020 to stop the virus's spread. People's lives were profoundly affected by this lockdown, especially in terms of their mental health and general wellbeing. This study examined Twitter data to gauge public opinion regarding the Indian lockdown. Using pertinent hashtags and keywords, we gathered tweets between April 20 and April 27, 2020, and we pre-processed the data using natural language processing methods. The tweets were divided into three categories using machine learning algorithms: neutral, negative, and positive. According to our research, the majority of people in India had positive opinions about the lockdown, and many of them expressed support for the measures.We additionally further categorized the comments using particular positive and negative terms. This study sheds light on how the Indian public views the lockdown and emphasizes the need for supportive and efficient communication to lessen the detrimental effects on mental health and general wellbeing.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI:10.15680/IJMRSET.2025.0806042, Vol 8, Issue No. 6, 2025, pp 9742-9748.*

Impact of Screen time on Quality of Sleep

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ABSTRACT

The increasing prevalence of digital devices in daily life has raised concerns about the potential impact of screen time on sleep quality. This study explores the relationship between excessive screen time and sleep disturbances. It investigates how exposure to screens before bedtime affects sleep patterns, the role of blue light emitted by screens, and the physiological and psychological mechanisms underlying sleep disruption. The paper reviews existing literature on the subject, highlighting the effects of screen time on sleep duration, latency, and overall quality. Additionally, it discusses potential consequences of impaired sleep, such as reduced cognitive function and increased stress levels, and provides recommendations for mitigating these effects. The findings suggest a correlation between excessive screen time and diminished sleep quality, emphasizing the importance of managing screen exposure, particularly in the hours leading up to sleep.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI: 10.15680/IJMRSET.2025.0806043, Vol 8, Issue No. 6, 2025, pp 9749-9754.*

The Impact of Aadhaar on Patient Records in India

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ABSTRACT

The introduction of Aadhaar,India's unique identification system,has brought massive changes to how patient records are managed within healthcare. Doctors will be able to link patient records with Aadhaar numbers that will ensure proper identification, eliminate duplication and in turn enable ease of access for the medical history.These articles analyze in detail the impact of Aadhaar on patient records with a specific focus on aiding record correctness, enhancing PTM and reducing healthcare delivery time. This research demonstrates, through data analysis and case studies, the advantages as well challenges regarding Aadhaar based integration in healthcare systems.The study concludes that while Aadhaar does considerably increase efficiencies and access, it also leads to privacy and security concerns.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI:10.15680/IJMRSET.2025.0806044, Vol 8, Issue No. 6, 2025, pp 9755-9759.*

Smart Contract Implementation in Real Estate Transactions

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ABSTRACT

This research investigates the integration of blockchain technology and artificial intelligence (AI) to create smart contracts for real estate transactions. The main objective is to improve transparency, minimize fraud, and automate the contractual process, thereby streamlining property deals. By leveraging blockchain, smart contracts ensure automatic execution of agreements when predefined conditions are met, eliminating the need for intermediaries and reducing transaction times. AI is utilized to analyse and verify transaction data, ensuring accuracy and compliance with legal standards. The research also explores how blockchain can offer a secure and immutable ledger of all transactions, further mitigating fraud risks. The combination of AI and blockchain presents a powerful solution for enhancing efficiency and trust in real estate transactions. Ultimately, this study aims to provide insights into how smart contracts can transform the real estate industry, making transactions faster, safer, and more transparent.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI: 10.15680/IJMRSET.2025.0806045, Vol 8, Issue No. 6, 2025, pp 9760-9765.*

The Role of Video on Demand in In Modern E-Learning

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ABSTRACT

This paper examines the role of Video on Demand (VOD) in modern eLearning, tracing the historical evolution and integration of web-based multimedia technologies in education. It explores how VOD addresses the growing demands of contemporary education by providing study materials, enhancing teacher-student interactions, and ensuring timely information dissemination. Emphasizing the importance of virtual classrooms powered by advanced multimedia technologies, the study highlights the effectiveness of online video and audio content delivery, with innovations like screen casting. Through a literature review of various eLearning systems, this research illustrates how VOD has become a crucial element in enriching the eLearning experience.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI:10.15680/IJMRSET.2025.0806046, Vol 8, Issue No. 6, 2025, pp 9766-9772.*

Real-Time Vehicle Detection for Autonomous Driving

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ABSTRACT

Real-time vehicle detection has become increasingly important as the automobile industry advances towards autonomous driving and advanced driver assistance systems (ADAS). This technology is essential for maintaining traffic flow and enhancing road safety. By focusing on deep learning and computer vision techniques, this study investigates the technologies and approaches involved in real-time vehicle recognition while driving. We examine several algorithms, including Faster R-CNN and YOLO (You Only Look Once), used to identify vehicles under various environmental conditions. The main contribution of this study is a thorough analysis of the implementation procedures, challenges encountered, and innovative solutions to improve processing speed and detection accuracy. We also explore the practical applications of real-time vehicle recognition in traffic monitoring, autonomous driving, and smart city projects. The purpose of this study is to provide a valuable resource for scholars, practitioners, and developers working on vehicle detection technologies and their integration into modern transportation systems.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI: 10.15680/IJMRSET.2025.0806047, Vol 8, Issue No. 6, 2025, pp 9773-9776.*

Design and Development of a No-Code Canvas Application for Customizable Dashboards

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ABSTRACT

The difficulty of changing production lines presents a barrier for Original Equipment Manufacturers (OEMs) trying to shorten time to market. Using no-code techniques to tackle these problems is investigated in this study. Here, I describe the conception and implementation of a canvas-based program for building Internet of Things (IoT)-specific dashboards that are customizable. Without writing any code, users may customize and link pre-built widgets to several data sources by simply dragging and dropping them onto a canvas. Wireframes, user stories, and input from BIBA (Bremer Institut für Produktion und Logistik GmbH) are all included in the document that describes the users-centric design approach. Creating a dashboard doesn't have to be complicated for people who don't know much about technology due to my approach.

**Full paper: International Journal of Multidisciplinary Research in Science, Engineering and Technology, DOI: 10.15680/IJMRSET.2025.0806048, Vol 8, Issue No. 6, 2025, pp 9777-9782.*

Internet of things (IoT) and Security with Data Science

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ABSTRACT

The Internet of Things (IoT) is rapidly transforming various sectors by enabling seamless connectivity between devices, leading to improved operational efficiency, enhanced decision-making, and innovative applications across industries such as healthcare, manufacturing, agriculture, and smart cities. However, this growing network of interconnected devices also presents substantial security challenges, including vulnerabilities to cyber-attacks, data breaches, and unauthorized access. This paper investigates the role of data science in bolstering IoT security, focusing on the application of machine learning, anomaly detection, and advanced data analytics. By analyzing large-scale IoT data, these techniques can identify and mitigate potential threats, ensuring the privacy, integrity, and reliability of IoT systems. The study synthesizes existing research, outlines key methodologies, and discusses future directions in the integration of data science with IoT security, aiming to provide a robust framework for addressing the evolving security needs of IoT ecosystems.

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Enhancing Security using Bcrypt for Password Hashing

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ABSTRACT

Enhancing security in web applications is a critical concern, especially in managing user authentication and password protection. Bcrypt, a popular password hashing algorithm, offers a robust solution for securing passwords by providing resistance to brute-force attacks and rainbow table attacks. This study explores the implementation of Bcrypt for password hashing in a full- stack application using React for the frontend and Node.js with Express for the backend. It emphasizes the importance of secure password storage and demonstrates the practical steps involved in integrating Bcrypt into the authentication workflow. This paper aims to provide a comprehensive understanding of Bcrypt's advantages in password security, including its salting mechanism and cost factor adjustment, which collectively enhance security against various attack vectors. By reviewing recent scholarly works, case studies, and technological trends, the findings suggest that Bcrypt significantly strengthens user authentication processes, thereby improving the overall security posture of web applications.

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Impact of AI on Job Market

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ABSTRACT

The purpose of this study is to assess the varied effects of machine learning (ML) and artificial intelligence (AI) on employment prospects and the labour market. It investigates how job replacement may be impacted by the growing use of AI and ML. The study looks at how AI is both generating new employment prospects and dislodging existing ones, especially in sectors that primarily rely on repetitive and routine work. The study also explores ways that organizations and governments can mitigate the negative impacts of job displacement and promote the creation of new employment opportunities in the AI and ML sectors. The overall conclusion is that, despite some potential negative consequences on the labour market, the opportunity for new job prospects in AI and ML outweighs any potential drawbacks.

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Smart Irrigation and Monitoring system

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ABSTRACT

Smart agriculture has emerged as a result of the recent transformation in farming practices brought about by the integration of Internet of Things (IoT) technologies. This study provides a comprehensive analysis of how realtime monitoring, data-driven decision-making, and automation made possible by IoT devices are revolutionizing agriculture. In order to gather data on soil moisture, temperature, humidity, and other important factors, a variety of sensors and devices are deployed as part of the Internet of Things' application in agriculture. These gadgets send the gathered data to a centralized system, where machine learning and advanced analytics algorithms process it to produce insights that may be put to use. These findings can be used by farmers to improve crop health, schedule irrigation more efficiently, and produce higher- quality yields. Furthermore, by enabling the accurate application of pesticides and fertilizers, IoT-enabled equipment enable precision farming, which lowers waste and its impact on the environment. The difficulties in using IoT in agriculture are also covered in the research, including problems with data security, large upfront expenditures, and connectivity in remote places. The useful uses and advantages of IoT in agriculture are demonstrated through an analysis of case studies from around the globe. Additionally, the potential of IoT to reduce resource consumption and mitigate the consequences of climate change is emphasized, along with its role in promoting sustainable agriculture practices. In order to create more resilient and fruitful agricultural systems, the paper's conclusion offers future possibilities for research and development in the field of smart agriculture. It makes the case that these directions can be achieved through ongoing innovation and investment in IoT technology.

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Precision Agriculture- IoT and Data Analytics for Optimal Yield and Resource Use

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ABSTRACT

In the near future, realizing the most yields in crops with a limited resource input is very key to the sustainability of food production in agriculture. Traditionally, farmers make crop yield predictions using experiencebased techniques that often lacked precision and efficiency. The integration of the Internet of Things technology and data analytics, therefore, ushered in a transition phase in agriculture by enhancing precision and efficiency in crop management practices. The second paper explores the power of fusing IoT and data analytics in precision agriculture in crop yield prediction and resource management. Real-time climatic data and soil nutrient status are captured by IoTenabled sensors, providing dynamic insights into variables of crop growth. These machine learning algorithms, run with predictive modeling techniques on this real-time data, provide improved predictive accuracy and permit informed decisions on agricultural operations.

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Electroencephalography: Integrating Information Technology to Unlock the Mysteries of Brain

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ABSTRACT

Understanding the neural processes underlying complex cognitive functions is a key goal of cognitive neuroscience. Electroencephalography (EEG), a non-invasive and cost-effective method, is vital for this purpose. EEG measures electrical activity from large groups of synchronously firing neurons using scalp electrodes, offering valuable insights into neurophysiological functions. This paper examines the fundamental principles of EEG, its integration with information technology, and its applications in diagnosing neurological disorders, cognitive neuroscience, and braincomputer interfaces. It also discusses recent innovations in EEG technology and ethical considerations. Integrating EEG with advanced computing and data analysis techniques enhances our understanding of the brain and fosters innovative solutions in neuroscience and healthcare.

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The Impact of AI on Enhancing Energy Efficiency in Smart Buildings

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ABSTRACT

In the era of modern urban living, efficient energy management in smart buildings is crucial for sustainability and cost reduction. Artificial Intelligence (AI) plays a significant role in enhancing energy efficiency by predicting energy usage, automating control systems, optimizing settings, and managing renewable energy sources. This paper explores how AI algorithms, such as machine learning and neural networks, can be applied to improve energy consumption in smart buildings. The study discusses various AI-driven solutions, real-world applications, and the benefits of integrating AI with IoT devices. Additionally, it highlights challenges, potential research directions, and the implications for both industry professionals and decision-makers in achieving more sustainable and efficient building management.

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JSON Web Token

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ABSTRACT

In almost every organization where user sensitive data is available, security and privacy of the data plays a vital role. As far as computer science is concerned, it is just a game of saving data in unrecognizable format and accessible to authorized person. User sensitive data mainly includes passwords which are required for the sessions but need to be handled and stored safely.As storage of these information is overhead in database, Tokens are generated which handles sessions and also self contains user details. One of such widely used stateless token is Json Web Token. This paper deals with the introduction, working and algorithms of Json web token. Also pros, cons, hacking possibilities, Proper usage and security measures of JWT are discussed.

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Comparative Analysis of Machine Learning Algorithms for Identifying Bank Fraudulent Activities

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ABSTRACT

Everyone is exposed to financial frauds. Fraud has become a major burning problem as financial services are used everywhere which caused increase in financial fraud activities, due to this business have started to use different anti-fraud methods by using machine learning as a tool to detect malicious actors. Machine learning system have all the processing power to quickly analyze large amount of data and identify fraudulent patterns. By reviewing some literature paper there are several machine Learning algorithm to identify the fraudulent activities. This research paper mainly focuses on finding the Bank fraudulent activities using different machine learning models. We use Random forest, and support vector machine to identify any kind of abnormal behaviour and check how accurate each of the algorithm in finding the fraudulent activity and then use it to evaluate the new transaction.

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Measuring the Fitness of Fitness Trackers

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ABSTRACT

Data collected by fitness trackers could play an important role in improving the health and well-being of the individuals who wear them. Many insurance companies even offer monetary rewards to participants who meet certain steps or calorie goals. However, in order for it to be useful, the collected data must be accurate and also reflect real-world performance. While previous studies have compared step counts data in controlled laboratory environments for limited periods of time, few studies have been done to measure performance over longer periods of time, while the subject does real-world activities. There are also few direct comparisons of a range of health indicators on different fitness tracking devices. In this study, we compared step counts, calories burned, and miles travelled data collected by three pairs of fitness trackers over a 14-day time period in free-living conditions. Our work indicates that the number of steps reported by different devices worn simultaneously could vary as much as 26%. At the same time, the variations seen in distance travelled, based on the step count, followed the same trends. Little correlation was found between the number of calories burned and the variations seen in the step count across multiple devices. Our results demonstrate that the reporting of health indicators, such as calories burned and miles travelled, are heavily dependent on the device itself, as well as the manufacturer's proprietary algorithm to calculate or infer such data. As a result, it is difficult to use such measurements as an accurate predictor of health outcomes, or to develop a consistent criteria to rate the performance of such devices in head-to-head comparisons.

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Innovations of Metaverse Technology in Healthcare: A Study on Melanoma Skin Cancer

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ABSTRACT

The metaverse technologies, consisting of virtual reality (VR), augmented reality (AR), and mixed reality (MR) among others, is reshaping medical care in many ways such as boosted patient attention and medication, education for medical practitioners as well as management of illnesses like melanoma skin cancer. This study examines some progressions that metaverse technology has made within public health through such an example as detection and cure of melanoma skin cancer. Early and accurate detection is necessary for improved patient outcomes, given the fact that Melanoma is the deadliest form of skin cancer. By 2024, about 100,640 new melanoma cases are predicted to occur in the U. S alone with 8,290 of them resulting into deaths (source: American Cancer Society). Melanoma cases are on the increase in India, with about 3,689 new cases reported annually (International Agency for Research on Cancer (IARC), 2022). Metaverse technologies provide immersive diagnostic aids that help improve surgical accuracy as well as simulation platforms that aid in healthcare professionals training. This paper aims to offer a comprehensive insight into how these innovations are improving medical care delivery and outcomes by reviewing recent scholarly works, cases, and technological trends. The findings suggest that there is a potential for VR, AR, and MR to transform many areas of medicine such as early detection, patient involvement in their own treatment plans, telemedicine as well as more complicated surgical procedures.

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The Impact of Job Portals on Employment Rates and Workforce Dynamics

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ABSTRACT

This paper is focused on the great importance and value of job portals in the new era of job employment rates and workforce dynamics. Job portals today have algorithms and research techniques that provide a transformative dimension to job-finding and employment. The paper follows a study on the various mechanisms in which job portals function with respect to candidate-job interaction, candidacy, and labor market dynamics. This paper identified, through a critical review of existing literature and an analysis of data, both the main advantages and some potential downsides of job portals. The research highlights job portals as potentially working sites containing merits and possible failures as shifting contributors to reducing unemployment rates, enhancing transparency in the labor market, and reshaping workforce dynamics. The conclusion offers insights into the future development of job portals, stressing the importance of continuous innovation and usercentric design to maximize their positive impact on the employment landscape.

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Enhancing Culinary Experience and Operational Efficiency through an Integrated E-Recipe Platform

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ABSTRACT

In the dynamic realm of culinary arts and kitchen management, the integration of technology has the potential to significantly enhance the culinary experience and operational efficiency. This research presents a detailed exploration of an integrated e-recipe platform designed to optimize both culinary creativity and kitchen operations. The study aims to investigate the effectiveness of this platform in managing recipes, personalizing user experiences, and streamlining kitchen workflows. The platform leverages advanced algorithms to provide tailored recipe recommendations based on user preferences, dietary restrictions, and historical cooking data. By integrating real-time ingredient management, the system helps users efficiently track inventory and manage procurement processes, thus reducing waste and enhancing operational efficiency. To evaluate the platform's effectiveness, the research employs a comprehensive approach, including the development of a user-friendly interface, the application of modern web development technologies, and rigorous performance testing. The study assesses various aspects such as system responsiveness, accuracy of recommendations, and overall user satisfaction. The platform's technological framework is based on cutting-edge web development tools, including ReactJS and Node.js, ensuring a robust and scalable solution. Data analytics and machine learning are utilized to offer intelligent meal planning and ingredient substitution recommendations, further improving user experience. Additionally, the research explores the impact of the e-recipe platform on operational efficiency within culinary settings. Metrics such as time saved in recipe management, reduction in ingredient waste, and overall improvements in kitchen workflow are analyzed to provide insights into the platform's effectiveness. The findings of this research aim to offer valuable information for developers, chefs, and food service professionals seeking to enhance their culinary practices through technology. By presenting a thorough analysis of the integrated erecipe platform, this study contributes to the understanding of how digital solutions can transform culinary experiences and optimize kitchen operations.

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The Impact of Solid Principles on Software Design and Development

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ABSTRACT

In modern software development, following design principles is essential for building systems that are both maintainable and scalable. This study explores "The Impact of SOLID Principles on Software Design and Development." Through case study analysis and surveys, we assess the influence of SOLID principles on code quality, maintainability, and team efficiency. The results show that adhering to SOLID principles greatly improves system modularity and flexibility, minimizes technical debt, and optimizes implementation.

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Next-Gen AI for Autonomous Vehicles: A Comprehensive Study

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ABSTRACT

The transformative role of Artificial Intelligence (AI) in the development and deployment of autonomous vehicles. By leveraging machine learning techniques, AI systems gather, analyze, and transfer data to make decisions traditionally made by human drivers. Over the past decade, significant advancements have been made by researchers and the automotive industry to enhance the safety, reduce traffic accidents, and mitigate the environmental impact of driverless cars. A critical component of this progress is the robust software architecture that ensures the reliable and stable operation of autonomous vehicles on public roads. By tracing the development of AI from theoretical concepts to modern applications in machine learning, deep learning, and neural networks, the study highlights key milestones and breakthroughs that have shaped AI's trajectory. Additionally, the paper examines ethical considerations, bias in AI software development, and the statistical usage of various AI algorithms within the automotive industry. It underscores the importance of parameters in refining algorithms for vehicles, enabling continuous learning and performance improvement.

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Transforming Healthcare: The Role of AI and Robotics in Enhancing Patient and Diagnostic Services

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ABSTRACT

The integration of Artificial Intelligence (AI) and robotics into healthcare has significantly reshaped service delivery, enhancing diagnostic capabilities and improving patient care. This paper explores the evolution and impact of these technologies within the healthcare sector. It delves into various implementations, from patient care enhancements using digital health platforms to advanced diagnostic systems facilitated by cloud computing and big data. The paper discusses both the benefits and challenges of adopting these technologies, emphasizing their transformative potentialwhile considering ethical and security concerns. Through comprehensive analysis and empirical evidence, the study aims to provide a nuanced understanding of how AI and robotics are pivotal in advancing healthcare services.

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Navigating Data Security and Privacy Assurance Challenges in Cloud Computing Paradigm

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ABSTRACT

There's no doubting that cloud computing is becoming increasingly popular since it provides a number of advantages that tempt businesses to move their applications and data to public or hybrid cloud environments. Larger firms are still hesitant to move their crucial business systems to the cloud, though. The initial predicted market size for cloud computing has not been met in reality. Consumer worries regarding cloud computing security, particularly those related to data security and privacy protection, are the main roadblocks to greater use of cloud services. The concerns regarding data security and privacy protection in cloud computing are thoroughly examined in this paper. The entire data life cycle is examined, and potential vulnerabilities are identified along with the current mitigation techniques and strategies. It also explores upcoming studies and initiatives aimed at increasing data security and privacy protections in the field of cloud computing.

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Impact of AI and Machine Learning on Medicine

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ABSTRACT

This paper explores how AI and ML enhance diagnostics, treatment plans, and patient care in medicine. It covers AI technologies such as neural networks, deep learning, and NLP, and their applications in medical imaging, predictive analytics, and personalized medicine. The study addresses data accuracy, model training, ethical considerations, and continuous improvement in AI-driven healthcare. Techniques like image recognition, predictive models, and AI-driven drug discovery are analyzed, along with the integration of AI in EHRs.

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A Case Study on Fake News Detection using Machine Learning Algorithms

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ABSTRACT

Given its potential to cause significant social and national harm with far-reaching implications, the widespread spread of fake news on social media and other platforms is an urgent concern. The identification and mitigation of this phenomenon are the focus of extensive investigation. This study uses two feature extraction techniques, Count Vectorization and TF-IDF, to examine the effectiveness of machine learning algorithms, namely Naive Bayes and Passive Aggressive, in identifying fake news. Four different experiments were carried out, using a CSV dataset and matching each algorithm with one of the two feature extraction methods. The results show different accuracy levels and confusion matrix metrics (false negative, false positive, true negative, and true positive values).

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Artificial Intelligence in Sports Analytics

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ABSTRACT

This research paper investigates how artificial intelligence (AI) and data science are revolutionizing the sports industry through performance analysis, injury prediction and game strategy optimization. Artificial intelligence technologies analyze vast amounts of sports data and help athletes improve their performance by identifying strengths and weaknesses through sensors and cameras. In addition, AI models predict potential injuries based on historical data, enabling proactive measures to be taken and ensuring the safety and longevity of athletes throughout their careers. In addition, AI helps coaches optimize game strategies by providing insights for detailed game and player analysis. Despite the many advantages, the article also discusses challenges such as data protection issues, technical limitations and the acceptance of artificial intelligence among sports professionals. Overall, this research highlights the significant impact of AI and data science in improving sports performance, predicting injuries and improving game strategies, providing a glimpse into the future of smart sports analytics.

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Smart Cities and Infrastructure using IoT

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ABSTRACT

This project uses Internet of Things (IoT) technologies to improve the management and development of urban infrastructure. By connecting IoT sensors and devices, the project gathers data on traffic, air quality, energy usage, and security in a simulated city environment. The main goal is to enhance urban living standards through technological innovations that assess environmental conditions, recognize critical issues, optimize resource and facility usage, and improve public service quality. The initiative aims to utilize IoT solutions to collect important information to assist city administrators in making informed decisions. Ultimately, the project seeks to promote a sustainable urban development framework, improve residents' quality of life, and minimize environmental impacts.

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Edge AI for Real-Time Healthcare Monitoring: A Survey

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ABSTRACT

In today's digital age, artificial intelligence (AI) at the edge has become a new tool in healthcare. This article will take an in-depth look at how edge AI processes collect, process, and analyze clinical data at the point of care, with a special focus on the use of wearable devices, Internet of Things (IoT) sensors, and mobile health. application form. This research will examine various methods and techniques used in artificial intelligence for the purpose of conducting healthcare research and decision-making, such as machine learning, artificial intelligence, signal processing, predictive modeling, and deep learning. These algorithms help provide timely and personalized treatment, but they raise data privacy and security concerns. This study investigates the impact of edge AI on privacy and data protection, as health data is processed and analyzed at the edge rather than sent to middle servers. The paper also explores solutions to ensure data privacy and security in edge AI applications, such as accessing, storing, and preventing data tracking. It highlights the need for better information and robust systems to secure medical information in healthcare. At the edge of intelligence, personalization and personalized care, protecting patient information, and solving privacy issues have many benefits for patients and physicians. A guide to data protection and the use of effective tools to help patients manage their health information and manage their personal digital healthcare.

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Apache Kafka

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ABSTRACT

This paper presents a comprehensive analysis of Apache Kafka and its crucial role in real-time data streaming and processing. We explore various components and features of Kafka, including producers, consumers, topics, partitions, and brokers, as well as its robust architecture. Through case studies, the paper illustrates Kafka's practical applications in different industries and evaluates its performance, scalability, and reliability. The findings highlight both the benefits and limitations of Kafka, offering insights into its future potential in handling large-scale data streams.

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Integrating AI with ReactJS the Next Generation of Web Components

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ABSTRACT

The integration of Artificial Intelligence (AI) with ReactJS heralds a new era in web component development. This paper explores the methodologies and benefits of combining AI with ReactJS, focusing on enhanced user experiences, intelligent automation, and adaptive interfaces. We will delve into the architecture, implementation strategies, and performance evaluations, highlighting the impact of AI-driven components in modern web development.

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Blockchain-Driven Digital Electoral System for India

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ABSTRACT

As a democratic country, India enables inhabitants above the age of eighteen to cast ballots to select the applicant they think would advance the nation's interests. Another essential citizen right is the aptness to vote. The method utilized to hold elections and cast ballots safely is called digital voting. Voters no longer need to physically congregate and can cast their ballots electronically instead of on paper thanks to digitization. In an election, they are limited to casting one ballot. The utility using blockchain technology in digital Voting procedures are being investigated through a survey. A promising solution that facilitates seamless transactions using distributed and decentralized technology is the blockchain. As stated by the literature, these systems use face authentication, fingerprint authentication, and other biometric authentication. Moreover, there are other blockchain-based frameworks for online voting. Hundreds of transactions can be processed at once by Ethereum, which is proven to be the greatest blockchain framework. This research presents a method for creating our nation's voting procedure that makes use of the Ethereum foundation, a retina scanner, and OTP for authentication while taking the aforementioned context into account. Blockchain technology enhances digital voting to improve security and address issues with the current voting methodology. The proposed system has the propemsity to manage fraud and conduct the electoral process remotely.

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ChatGPT: Educational Artificial Intelligence

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ABSTRACT

On November 30, 2022, OpenAI published ChatGPT, a general-purpose discussion chatbot that is anticipated to have a significant influence on all facets of society. The prospective effects of this NLP tool on education, however, are still unclear. The capacity of ChatGPT may influence adjustments to learning activities, educational learning objectives and assessment and evaluation procedures, which might have a significant impact. In order to create this essay, I piloted ChatGPT as part of a research (see, ChatGPT User Experience: Implications for Education). ChatGPT, according to the pilot study, can help academics write articles that are systematic, coherent, (mostly) right, and instructive. The author's professional experience was used sparingly to complete the article in 2 to 3 hours. I investigate the potential implications of ChatGPT and other similar AI technologies on education in the paper, relying on user experience. The report suggests modifying learning objectives, with an emphasis on enhancing students' creativity and critical thinking rather than broad skill development. Students should be able to employ AI tools to carry out subject-domain activities. Researchers should create AI-based learning projects that involve students in addressing realworld problems in order to meet the learning objectives. Concerns about students contracting out their assessment work are also raised by ChatGPT. The article comes to the conclusion that new evaluation forms are required to emphasise creativity and critical thinking, which AI cannot replace (for details, read the paper).

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AI and Machine Learning in Educational Performance Tracking

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ABSTRACT

Artificial Intelligence (AI) and Machine Learning (ML) have emerged as transformative technologies in various fields, including education. This research paper explores the application of AI and ML in tracking and enhancing educational performance. By leveraging these technologies, educators and institutions can gain valuable insights into students' learning patterns, strengths, and weaknesses, allowing for personalized and adaptive learning experiences. The integration of AI and ML in educational performance tracking involves analyzing vast amounts of data generated by students through their interactions with digital learning platforms, assessments, and other educational tools. This data-driven approach not only helps in identifying at-risk students and tailoring interventions but also assists in curriculum development and improving teaching methodologies. The paper will discuss current implementations, benefits, challenges, and future prospects of AI and ML in educational performance tracking, providing a comprehensive overview of how these technologies are shaping the future of education.

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Digital Transformation in the Workplace: Unlocking Productivity in the Information Age

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ABSTRACT

In the modern business environment, marked by intense competition and rapid changes, integrating digital tools and technologies is crucial for improving efficiency, collaboration, and overall performance. The evolution of communication methods and lifestyle trends has created a workforce with heightened expectations for workplace technologies. This paper investigates the essential elements of digital workplaces, including communication tools, collaboration platforms, cloud services, and mobile technology, and their roles in boosting productivity. It examines the increasing interest in smart workplace technologies, underscores the significance of these innovations, and pinpoints factors critical to their successful implementation. Through an analysis of benefits, strategies for implementation, and potential challenges, this study offers a thorough insight into how digital transformation enhances workplace productivity. Additionally, it presents a case study on the effective deployment of smart workplace technologies within a small service industry, discussing emerging trends and future innovations.

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Data Hiding in Audio using AES Algorithm

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ABSTRACT

The practice of data hiding entails keeping information secret for a variety of purposes, including maintaining privacy, protecting secret information, and more. Data exchange via the internet network must be done securely. Therefore, there are numerous ways to securely transmit data to the destination, including steganography and cryptography. In this study, we propose using the AES algorithm to embed data into images, which is accomplished using C#.NET and the Microsoft.NET framework.

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Service Robotics in Service Management

Divya

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ABSTRACT

Service robotics in service management is an emerging field that leverages advanced technologies to enhance efficiency, reduce operational costs, and improve customer satisfaction. This research investigates the integration of service robots in the hospitality industry, focusing on how perceived risk and information security concerns influence customers' intentions to use these robots. The study also examines the roles of self-efficacy, innovativeness, and facilitating conditions in shaping customer acceptance and usage. By exploring these factors, the research aims to provide actionable insights for hotel management and service robot developers, facilitating the effective deployment and acceptance of robotic services. The findings highlight the potential of service robots to transform service delivery, while also addressing key challenges and barriers to their widespread adoption.

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Exploring ACID and BASE Models in Modern Database Transaction

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ABSTRACT

This paper explores and compares the ACID (Atomicity, Consistency, Isolation, Durability) and BASE (Basically Available, Soft state, Eventually consistent) database transaction models. ACID, a foundational model in relational database systems, provides strong guarantees for transaction reliability and data integrity, making it effective in traditional SQL databases. In contrast, BASE has emerged as a flexible alternative suited for modern applications requiring horizontal scaling and real- time data availability. By examining the core principles, advantages, and limitations of both models, the paper assesses their impact on performance, scalability, and data consistency. Through literature review and performance benchmarks, this research aims to guide database architects and developers in selecting the most suitable transaction model for their specific needs. The findings also consider the methodologies used in real-world implementations, offering practical insights into the effective application of ACID and BASE models.

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Zero Waste Service: An Integrated approach to Sustainable Service Management

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ABSTRACT

This paper explores the concept of zero waste service management, emphasizing an integrated approach to achieve sustainability goals. It examines how organizations can adopt comprehensive strategies to minimize waste generation throughout service delivery processes. Key components include waste reduction at the source, efficient resource utilization, and the implementation of circular economy principles. The study evaluates case studies and best practices from various industries to illustrate successful implementations of zero waste strategies. The findings highlight the economic, environmental, and social benefits of adopting such approaches, providing insights into overcoming challenges and achieving long-term sustainability in service management.

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Leveraging Educational Data Analytics for Enhanced Learning Outcomes

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ABSTRACT

Educational Data Analytics (EDA) integration has been an important tool for this. development of new teaching structure and curriculum design to drive efficiency in student learning outcomes. EDA helps educators to make well informed decisions, personalized learning expansions boost student success. These range of the data sources that were used, from GPAs to digital bread resuscitations and how they are used to flag at- risk students and customize support. Advanced techniques like machine learning and predictive modeling reveal insights lurking within the masses of complex data, helping with decision making. Nevertheless, there are challenges such as privacy and bias. Looking For example, the promise is that significant technological advances (e.g., AI) can happen on a schedule. In short, the EDA could transform it education accessible and more suited to the learning needs of everyone. By fostering collaboration. If we tackle the issues, and substantial challenges then perhaps this digital revolution may come of age in order than bring us a better world.

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AI and IOT-Based Healthcare

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ABSTRACT

The convergence of Internet of Things (IoT) and Artificial Intelligence (AI) holds immense promise in revolutionizing healthcare assistance. Leveraging a multitude of sensors, IoT devices collect a diverse array of patient data, encompassing fitness metrics, medical reports, and health activities. AI processes this information to bolster the precision of patient assistance. Through a dedicated healthcare mobile application, this data is seamlessly transmitted to the cloud, where optimized machine learning techniques are applied. Recent technological advancements, including IoT and 5G, have ushered in a paradigm shift towards personalized healthcare services. The emerging Healthcare 5.0 paradigm focuses on real-time patient monitoring, privacy compliance, and the integration of AI driven technologies. Notably, the state-of-the-art Healthcare 5.0 seeks to address the limitations of prior healthcare systems by considering the interdependent effects of various health conditions on a patient. Within this landscape, Explainable AI (EXAI) emerges as a critical trend, enhancing the interpretability of traditional AI models in healthcare. This survey delves into the requirements of EXAI in Healthcare 5.0, proposing a comprehensive architecture.

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Enhancing SEO with Next.JS

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ABSTRACT

This study investigates the effects of adopting the well-liked React framework Next.js on search engine optimization (SEO). It demonstrates how server-side rendering and incremental static regeneration (ISR) in Next.js enhance website performance, user experience, and search engine exposure.

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Honeypot Technology

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ABSTRACT

This paper presents a thorough examination of honeypot technology and its pivotal role in strengthening cybersecurity defenses. We analyze various types of honeypots, including low-interaction, highinteraction, and hybrid models, and evaluate their implementation strategies. Through case studies, it illustrates the practical applications and effectiveness of honeypots in detecting and analyzing cyber threats. The findings highlight both the advantages and limitations of honeypot technology, providing insights into its future potential in combating evolving cyber threats.

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Securing Enterprise Systems: Token-Based Authorization for Cyber-Threat Prevention

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ABSTRACT

The security of enterprise systems is now a top priority for businesses all over the world due to the surge in sophisticated cyberattacks. Token-based authentication has emerged as a key component in improving the security of these systems, with a focus on JSON Web Tokens (JWTs). In-depth investigation of the function of JWTs in bolstering authorization and authentication processes is provided by this study, providing a strong barrier against possible breaches. Through an analysis of the algorithms and procedures behind JWT-based security, this paper clarifies how JWTs can be successfully incorporated into current enterprise security frameworks. The paper highlights the benefits and drawbacks of JWT technology in practical applications by an extensive evaluation of the body of recent literature and an analysis of numerous JWT implementations. It talks about how implementing JWTs can have advantages like increased scalability and flexibility as well as less reliance on antiquated authentication techniques that are frequently vulnerable to hacking. On the other hand, the study also discusses the inherent difficulties, such as possible weak points and the difficulties in guaranteeing safe token administration among dispersed systems. With the purpose of offering system administrators, developers, and organizational leaders practical insights, this thesis hopes to further the current conversation on enterprise security. It supports a well-rounded strategy for integrating JWTs, emphasizing the value of thorough security measures in addition to utilizing the sophisticated features of JWTs. In the end, this study aims to steer token-based authorization toward a future where JWTs are a fundamental component of robust and secure enterprise systems in the digital era.

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Artificial Intelligence in Recruitment Process

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ABSTRACT

The recruitment process poses significant challenges for many businesses, often being both costly and time- consuming. Identifying the right candidate can be hindered by flawed decision-making or a lack of objectivity, making the hiring process inefficient. To address these issues, businesses are increasingly turning to technology. Many companies now utilize internet and software tools to manage applications and evaluate candidates. However, these methods still require substantial time and personnel coordination, leading to additional costs. In response to these challenges, there has been a notable rise in the adoption of artificial intelligence in recruitment processes globally. Artificial Intelligence can streamline the hiring process by reducing costs, minimizing decision-making errors, and saving time. It assists managers by simplifying tasks and making the process more efficient. Nonetheless, there is a perception that AI could potentially replace human workers, regardless of the job type. The shift towards automated systems offers benefits such as reduced workload and decreased error rates, making work more efficient.

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Plant Disease Detection using Image Processing and Machine Learning

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ABSTRACT

Plant diseases pose a significant threat to global agricultural production, leading to substantial economic losses and affecting food security. Early and accurate detection of plant diseases is essential for effective disease management and control. Traditional methods of disease detection are labor-intensive, time- consuming, and prone to human error, making them impractical for large-scale agricultural operations. This paper proposes an automated approach to plant disease detection using image processing and machine learning techniques. The approach involves several stages, including image acquisition, pre-processing, segmentation, feature extraction, and classification, all of which are crucial for accurate disease identification. The research evaluates different machine learning algorithms, such as Support Vector Machines (SVM) and Convolutional Neural Networks (CNN), to determine their effectiveness in classifying various plant diseases. The results demonstrate that the proposed method significantly improves the accuracy and efficiency of plant disease detection, providing a valuable tool for sustainable agriculture.

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Image-Based Data Hiding with AES Encryption

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ABSTRACT

With the increasing need for secure data transmission over the internet, data hiding has become crucial for maintaining privacy and protecting sensitive information. This research explores the integration of Advanced Encryption Standard (AES) encryption with image steganography to achieve secure data concealment. Using Python .we developed a system that embeds encrypted data into images, ensuring that the presence of the data remains hidden. The proposed method leverages the strengths of both cryptography and steganography to provide a robust solution for secure data exchange. Our findings demonstrate the effectiveness of this approach in safeguarding personal information and secret data during transmission.

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A Review on Network Load Balancing Approaches in Cloud Computing

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ABSTRACT

With only an internet connection, cloud computing allows you to access sophisticated computing resources, such as a supercomputer, from any location in the globe. It's a technical revolution that's changing how traditional methods of data maintenance and application access are done. Load distribution in the cloud has evolved from simple, fundamental methods to adaptable, complex algorithms. This ensures optimal resource use and application performance. Simple load distribution was employed at first, but as cloud computing matured, more sophisticated strategies like auto-scaling and predictive algorithms emerged to distribute resources more effectively, boost performance, and adjust to shifting workloads. Load balancing is essential to cloud computing because it distributes incoming communication or computational activities among multiple servers or resources. This not only guarantees optimal resource use but also prevents individual servers from being overworked. The difficulties in distributing load in diverse computing settings are reviewed in this work and also presented in a tabular format.

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Lung Cancer Detection using CT Scan Images

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ABSTRACT

Worldwide, lung cancer is the most common cause of cancer-related fatalities, and survival chances can be increased with early detection. A key tool for the identification and diagnosis of lung cancer is computed tomography (CT) imaging. Deep learning algorithms have recently demonstrated remarkable improvements in the precision of lung cancer identification using CT images. This review paper presents an overview of current developments in the CT scan image-based deep learning algorithms for lung cancer detection. We provide a summary of the various deep learning models, such as end-to-end models and multi-scale feature extraction models, utilised for lung cancer detection. We also go over the difficulties and constraints these models face, such as the necessity for sizable annotated datasets and explainable AI in medical applications. We conclude by highlighting the possibility for further study in this field and its future potential, including the application of transfer learning and the incorporation of multimodal data for increased accuracy.

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Eyering: The Motivation for Visually Impaired People

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ABSTRACT

People who are blind or visually challenged usually use aural feedback to obtain information on electronic devices such as Android OS smartphones. This modality isn't always the best way to produce something, though. Hegemonic strategies are those that enable covert and private connection. This study presents Eyering technology, a finger-worn gadget that enables the use of pointing gestures. It provides a plethora of opportunities for resolving everyday issues for both the sighted and the visually impaired. The World Health Organisation (WHO) estimates that there were roughly 60 million visually impaired persons residing in the United States and Europe in 2011.'EyeRing' technology is invented by Roy Shilkrot (PhD student) and another person Suranga Nanayakkara (Alumnus) who received his PhD in 2010 and BEng in 2005 from National University of Singapore (NUS).The EyeRing concept mainly based on the Pointing Gesture, Computer Vision and Text to Speech Synthesis technologies and consists Hardware (Microcontroller, Image Acquisition Module, Wireless Module) with Software (Computer vision software).A visually impaired user worn this device on index finger. A user single click the pushbutton switch on the side of EyeRing with his thumb. Instantly, snapshot of an image is taken and transferred via Bluetooth to the smartphone. The smartphone Analyze an image. After analyzing the image data, smartphone based on Android OS uses a Text-to-Speech module to read the information using Headset. Also we can give verbal command by double-clicking the pushbutton. We conclude that EyeRing technology Motivates visually impaired people and also reduces effort and disruption to a sighted user.

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Human-AI Relationship Dynamics

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ABSTRACT

This paper investigatesthe shifting dynamics of the interaction between humans and artificial intelligence (AI). It explores the influence of AI on various facets of human existence, encompassing social, economic, and ethical aspects. The study examines the increasing integration of AI systems into daily activities and its implications for human autonomy and decision-making processes. It discusses key challenges and opportunities that arise from this relationship, with an emphasis on promoting a collaborative and ethical coexistence. The paper also offers policy and practice recommendations to ensure positive outcomes from AI developments. The research delves into the role of AI in augmenting human capabilities while addressing the potential risks associated with excessive dependence on intelligent systems. It includes case studies from various sectors to demonstrate the wide-ranging applications of AI and its transformative impacts. Additionally, the paper explores public perceptions of AI and the critical importance of transparency and trust in human-AI interactions. It underscores the need for interdisciplinary approaches to comprehend and manage the complexities of AI integration. The findings highlight the necessity for ongoing education and awareness to keep pace with rapid technological advancements. Finally, the paper proposes future research directions to further investigate the complex relationship between humans and AI.

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Smart Contract Implementation in Real Estate Transactions

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ABSTRACT

This research investigates the integration of blockchain technology and artificial intelligence (AI) to create smart contracts for real estate transactions. The main objective is to improve transparency, minimize fraud, and automate the contractual process, thereby streamlining property deals. By leveraging blockchain, smart contracts ensure automatic execution of agreements when predefined conditions are met, eliminating the need for intermediaries and reducing transaction times. AI is utilized to analyse and verify transaction data, ensuring accuracy and compliance with legal standards. The research also explores how blockchain can offer a secure and immutable ledger of all transactions, further mitigating fraud risks. The combination of AI and blockchain presents a powerful solution for enhancing efficiency and trust in real estate transactions. Ultimately, this study aims to provide insights into how smart contracts can transform the real estate industry, making transactions faster, safer, and more transparent.

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Development of a Visitor Recognition and Alert System using Face Recognition

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ABSTRACT

Education has always been one of the mainstays of our society, providing both knowledge for individual minds and a prop to personal growth. It gives people the tools, information, skills that they require to thrive and live ful work lives in society. Besides book knowledge, education helps people develop complex ways of thinking that can solve problems and create things; that make up what we call creativity. Education facilities all provide people of all ages with information and skills to enable them to cope with future challenges. In this way education supports the idea of lifelong learning, while immersing our people in the habits necessary to attain success at work and personal life. Because when we invest in education, we are laying a cornerstone for both personal and professional success in the future. And by investing in the future of society, we grant talented people an opportunity to realize their full potential.Our system offers a practical solution for real-time visitor identification, making it easier to manage and monitor who enters your premises.

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Smart Healthcare: Real Time Patient Monitoring using IoT

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ABSTRACT

Patient Health Monitoring System (PHMS) is a new solution using IoT technology that can be used to monitor and track patients' health in real time. Thanks to advanced data analysis and machine learning algorithms, PHMS can provide real-time information and alert healthcare providers to any abnormal or potentially dangerous conditions. Integrating IoT technology into healthcare not only improves care efficiency but also facilitates early detection and health management, ultimately helping to improve patient outcomes and reduce

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3D Printing Technology

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ABSTRACT

A disruptive technology with the potential to transform many sectors is 3D printing. This seminar intends to offer a thorough examination of 3D printing, including its fundamental ideas, practical uses, and the revolutionary potential it has for the industrial industry and beyond. Beginning with an overview of the fundamental ideas behind 3D printing, the seminar will go into the materials used, the additive manufacturing process, and the various types of 3D printing technologies that are currently accessible. It will emphasize the benefits of 3D printing over conventional production techniques, including lower prices, more flexibility in design, and quicker prototyping capabilities. The growing popularity of 3D printing in recent years is emphasized, along with its potential to simplify the design, slicing, and printing processes, and to support the reinforcement of coding concepts.

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Precision Monitoring: Unveiling the Science Behind Blood Sugar Monitoring using Machine Learning

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ABSTRACT

Blood sugar monitoring is crucial to managing diabetes, as it allows individuals to maintain optimal glycemic control and prevent complications. People with diabetes should monitor their blood sugar levels because it allows them to control their illness more effectively and avoid problems. Traditional procedures, such as finger pricks, can be unpleasant and time-consuming for patients. New devices that employ machine learning algorithms are being developed to make blood sugar monitoring more convenient and less intrusive. In addition to doses of insulin or other specific to the patient's characteristics, these approaches estimate blood sugar levels using data gathered from sources such as continuous glucose monitoring (CGM), blood pressure measurements, or food information. This article discusses how machine learning algorithms may reliably predict blood sugar levels based on these parameters. It also goes into the steps involved in developing these systems, such as feature engineering, model selection, and assessment approaches. The suitability of several machine learning methods, including Support Vector Classification (SVC), Random forests, Naive Bayes Classifier, and K-Nearest Neighbour (KNN) Classifier, for blood sugar prediction tasks is examined. The potential for personalized diabetes care, early detection of hypo- and hyperglycaemic episodes, and integration with digital health platforms is emphasized. Overall, highlights the transformative potential of machine learning in revolutionizing blood sugar monitoring and improving the lives of people with diabetes.

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Unveiling the Secrets of Targeted Advertisements

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ABSTRACT

In today's digital age, targeted advertising has become an important part of online user experiences. Third- party apps and services use various algorithms and technologies to collect user data, classify users into specific categories, and deliver personalized and targeted ads based on user behavior and preferences. This report provides an in-depth exploration of the methods used by third-party apps to collect and analyze user data, with a focus on the use of location data, browsing history, search history, social media activity, and user-generated content. This study aims to examine the different algorithms and technologies used by third-party apps to analyze user data and deliver targeted ads, including Machine Learning, Artificial Intelligence, Natural Language Processing, Collaborative Filtering, and Deep Learning. These algorithms are highly effective in delivering personalized ads to users, but they also raise concerns about privacy and data protection. This report discusses the implications of targeted advertising for privacy and data protection, as users' personal information is being collected and used by third-party apps without their explicit consent. The report also examines the potential solutions for users to protect their data and opt-out of targeted advertising, including browser extensions, privacy settings, and data protection regulations. It highlights the need for increased awareness and control over the use of personal data in targeted advertising. While targeted advertising can provide benefits to both users and advertisers, it is important for users to have the option to control their data and optout of targeted advertising if they choose to do so. This report calls for the implementation of effective data protection regulations and user-friendly tools that enable users to take control of their data and protect their privacy in the digital age.

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Optimizing Search and Filtering Algorithms in Menu Bucket List Applications

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ABSTRACT

In the fast-paced world of digital applications, the efficiency of search and filtering algorithms is crucial for optimizing user experience and operational performance. Traditional search and filtering methods often struggle with precision and scalability, particularly in applications handling large datasets and diverse user preferences. This paper presents a hybrid search algorithm that combines content-based and collaborative filtering techniques, specifically designed for menu bucket list applications. By integrating advanced machine learning and natural language processing tools, the hybrid algorithm dynamically adapts to user behaviors and preferences, improving the relevance and speed of search results. Through rigorous testing and evaluation, we demonstrate that this approach significantly enhances the accuracy and scalability of search operations, leading to a more personalized and efficient user experience. The findings underscore the potential of hybrid algorithms to transform food discovery applications, offering a scalable and adaptive solution for modern digital platforms.

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The MERN Stack's Payment Security Analysis

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ABSTRACT

The MERN stack, which includes MongoDB, Express.js, React, and Node.js, is the subject of this study, which focuses on payment security concerns. With the rising notoriety of online installments, guaranteeing strong safety efforts in web applications is of most extreme significance. This paper focuses on MongoDB for data storage, Express.js for the web framework, React for the front end, and Node.js for the server-side runtime environment to examine the security features and best practices of each component of the MERN stack. In order to determine the advantages and disadvantages of each component in terms of payment security, a comparative analysis is carried out. In order to highlight successful implementations and lessons learned, real-world case studies are presented. The discoveries of this exploration give experiences into upgrading installment security in MERN stack applications and give suggestions for designers and associations.

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Cloud Storage Security and Privacy: Recent Advances Challenges and Future Research Directions

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ABSTRACT

Cloud storage security and privacy are critical concerns in contemporary computing, given the increasing reliance on cloud platforms for data storage and processing. This literature review examines recent advancements, challenges, and future research directions in this field, focusing on nine research papers published between 2019 and 2024. The review explores topics such as encryption methodologies, authentication mechanisms, access control strategies, data protection techniques, and privacy preservation in cloud environments. By synthesizing findings from diverse studies, this review provides insights into the current landscape of cloud storage security. It identifies significant progress in enhancing data integrity, confidentiality, and resilience against cyber threats. However, persistent challenges in managing data access across heterogeneous cloud infrastructures highlight the need for continued research and innovation. Future research avenues include decentralized encryption models, improved data auditing frameworks, and the integration of machine learning for adaptive security measures. This abstract aims to inform practitioners and researchers about crucial aspects of cloud storage security, emphasizing the importance of robust security measures in ensuring the confidentiality and integrity of cloud-hosted data.

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Energy-Efficient Smart Buildings: Integrating IoT for Sustainable Living

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ABSTRACT

Applications of the Internet of Things (IoT) are rapidly utilized in smart buildings and smart cities to reduce energy consumption. This advancement has caused a knowledge gap in applying IoT effectively by experts in the built environment to achieve energy efficiency. The study aims to provide an extensive review of IoT applications for energy savings in buildings and cities. This study contributes to the field of IoT by guiding and supporting built environment experts to utilize IoT technologies. This paper performed a thorough study using a systematic review that covered an overview of IoT concepts, models, applications, trends and challenges that can be encountered in the built environment. The findings indicated limitations in developing IoT strategies in buildings and cities by professionals in this field due to insufficient comprehension of technologies and their applied methods. Additionally, the study found an indefinite implementation and constraints on using IoT when integrated into the built environment. Finally, the study provides critical arguments and the next steps to effectively utilize IoT in terms of energy efficiency

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Data Analytics and Customer Insights for Online Crockery Store

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ABSTRACT

With the development of online shopping platforms, users are able to express their needs and feelings through online reviews. The analysis of comments from users can help to understand the real needs of users, the iteration of facilitate product and the service transformation of companies. The data analytics methods can be used to analyse user reviews, which can help designers gain the user needs on a macro perspective, while the traditional small data methods can help designers obtain the capture users' implicit preferences and differential needs. Therefore, the fusion of large and small data methods can help designers to study user needs more foundly and accurately. Taking kitchen storage products as an example, this paper firstly crawled the product reviews on the small website using data analytics methods and the sentiment analysis of reviews was detected.

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Customer Relationship Management using Clustering Algorithm (K)

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ABSTRACT

Customer Relationship Management (CRM) in e-commerce platforms plays a crucial role in cultivating lasting relationships with customers and driving business growth. CRM helps to get customers by knowing their necessities, holding existing customers by fulfilling their necessities and drawing the attention of new customers by providing different marketing strategies. High value customers are performing vital role to measure the effectiveness in CRM. The competition for High value customers is the central point of CRM. Customer classification can help CRM to identify different type of customer for the growth of their organization. We have applied machine learning algorithms to classify the customers in CRM. Basically we have applied k-means clustering for this purpose.

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Sentiment Analysis of Product Review using Natural Language Processing (NLP)

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ABSTRACT

Sentiment analysis, also known as opinion mining, is an essential NLP technique used to analyze and extract subjective information from text data. This focuses on evaluating product reviews to determine customers' sentiments, categorizing them as positive, negative, or neutral. By leveraging NLP techniques and machine learning models, this aims to provide insights that can help businesses understand customer feedback better and improve their products and services. The implementation utilizes widely available libraries and tools, making it both accessible and straightforward.

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The Impact of NoSQL Databases on Data Management and Analysis in Smart Cities

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ABSTRACT

The rapid growth of smart cities, driven by ICT and IoT, generates vast and complex datasets. Traditional relational databases often struggle with the volume and variety of this data, causing inefficiencies. This study examines the impact of NoSQL databases on data management in smart cities. The study concludes that adopting NoSQL databases can improve the efficiency of smart cities. Future research should explore hybrid database solutions and assess NoSQL reliability in smart city environments.

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Iris Recognition Using Densenet201: Minimal Vs. Traditional Preprocessing with Cosine-Based Verification

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ABSTRACT

In this work, we explore and compare two different approaches for iris recognition using the CASIA-IrisV1 dataset. The first approach uses DenseNet201 with minimal preprocessing to extract unique and distinct features from grayscale images of the eye. The second approach uses a more traditional way: it first performs iris segmentation, normalization, and contrast enhancement, then extracts features using the same DenseNet201 model. Both approaches create 512-dimensional feature vectors and compare them to confirm identity; Approach 1 uses cosine similarity while Approach 2 uses cosine distance. The tests show that Approach 1 outperforms Approach 2, with an accuracy of 90.59% compared to 84.71% for Approach 2. These results show that even minimal preprocessing can be enough to capture valuable features for iris recognition when employing powerful deep learning models like DenseNet201. The traditional approach is still helpful, especially when control over preprocessing steps and interpretability are essential. All things considered, this study makes clear the true amount of preprocessing needed and how it affects iris recognition algorithms.

**Full paper: Proceedings of the International Conference on Intelligent Systems and Pioneering Innovations in Robotics and Electric Mobility (INSPIRE), DOI: 10.1109/INSPIRE67328.2025.11300589, Mangalore, 20-21 November 2025, pp 677-682.*

Harnessing Machine Learning For Real-Time Yoga Pose Detection

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ABSTRACT

Yoga is an ancient Indian system, is progressively becoming an integral part of daily life across the world to keep up our mental and body health. However, practicing different Asanas of yoga requires proper and definite knowledge of its postures, as incorrect poses may lead to adverse effects. The proposed work introduces a system that detects yoga pose in real time. It supports independent, affordable yoga practices without expert supervision using computer vision and machine learning techniques. The proposed system uses webcam input to extract 33 body key points through the structure of mediapipe posture assessment. These traits can be categorized into five yoga poses, like downward dog, tree, warrior, plank and goddess pose etc using several controlled teaching methods. Among the assessed classifiers, the Support Vector Machines model reached the highest performance with 98% accuracy prior to Random Forest (97%), Artificial Neural Networks (ANN) (63%), and Convolutional Neural Networks (CNN) (28%). The SVM model is integrated into a flask based web application and provides real time feedback, user authentication, session monitoring, and personalized progress monitoring. The experimental results demonstrate the effectiveness of the proposed system to ensure accurate recognition of posture while maintaining simple deployment, highlighting its potential as a digital wellness tool that provides accessible and personalized experts for yoga support.

**Full paper: Proceedings of the International Conference on Intelligent Systems and Pioneering Innovations in Robotics and Electric Mobility (INSPIRE), DOI: 10.1109/INSPIRE67328.2025.11300579, Mangalore, 20-21 November 2025, pp 671-676.*

Lung Cancer Prediction System using CNN and Machine Learning Algorithms

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ABSTRACT

Lung cancer, the leading cause of cancer-related mortality worldwide, is often diagnosed at advanced stages, limiting treatment efficiency. This paper introduces a hybrid system integrating Convolutional Neural Networks (CNNs) with the VGG16 architecture for early detection via CT-Scan analysis. A web-based platform supports administrators, doctors, and patients, leveraging the IQ-OTH/NCCD augmented dataset of 9460 images across normal, benign and malignant categories. Achieving 95.25% accuracy after 100 epochs, this non-clinical outcomes and reduced healthcare disparities.

**Full paper: Proceedings of the International Conference on Intelligent Systems and Pioneering Innovations in Robotics and Electric Mobility (INSPIRE), DOI: 10.1109/INSPIRE67328.2025.11300567, Mangalore, 20-21 November 2025, pp 647-652.*

Data Driven Crop Yield Forecasting

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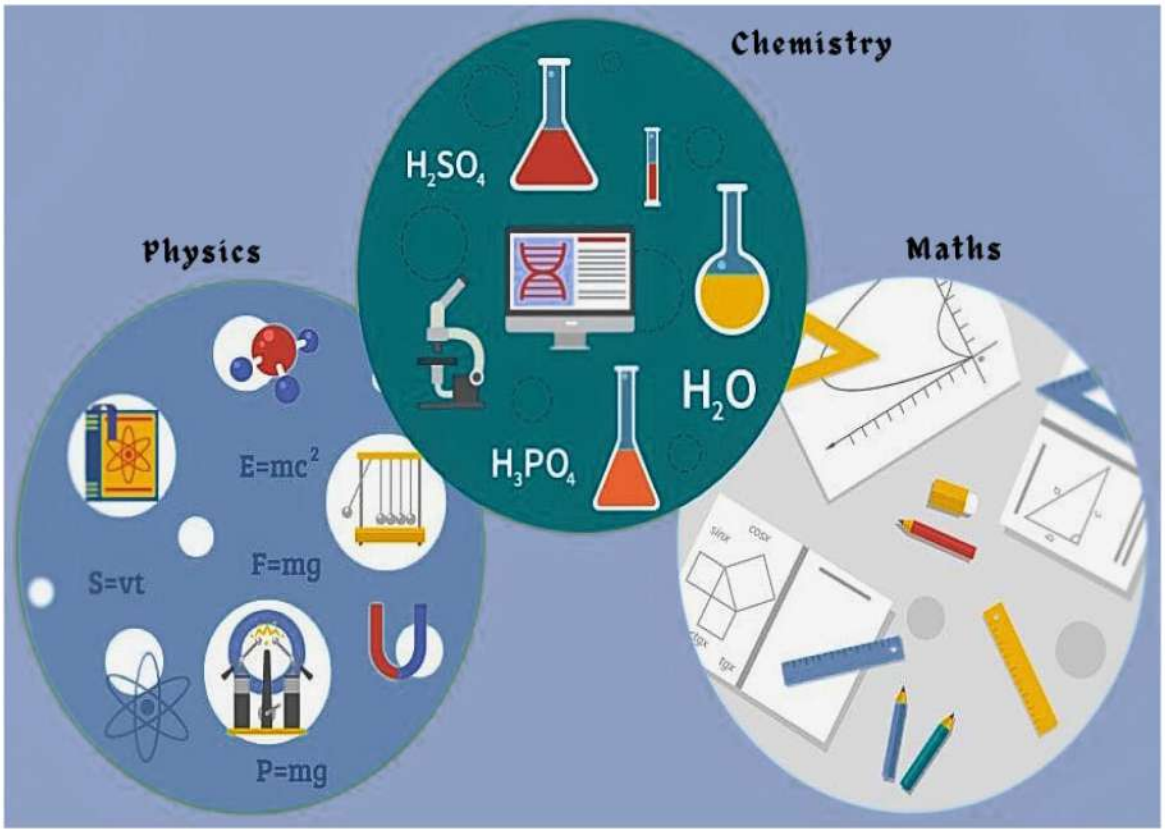
ABSTRACT

Accurate prediction of crop yield plays an important role in agricultural sustainability by enabling efficient resource use and thereby improving productivity. In this paper, a machine learning-based model for Maize yield prediction based on past and present climate data is proposed. In contrast to recent work on hybrid models with low interpretability and high mean absolute error, our model employs interpretable models—Random Forest(RF) and XGBoost that yield much improved performance. Past climate data from Kaggle were preprocessed, normalized, and outlier values were removed. A location-aware API-based Flask web application employs present climate data. RF provided the best performance among all the models tried with an R2 score of 0.9322. These results prove that application of interpretable models with real-time data is highly effective for smart agriculture purposes.

**Full paper: Proceedings of the International Conference on Intelligent Systems and Pioneering Innovations in Robotics and Electric Mobility (INSPIRE), DOI: 10.1109/INSPIRE67328.2025.11300580, Mangalore, 20-21 November 2025, pp 665-670.*



DEPARTMENT OF BASIC SCIENCE

MATLAB: A Game Changer in Mathematical Education

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ABSTRACT

Mathematics is universally recognized as the language of science. To describe any scientific or engineering phenomena, Mathematics plays an important role. Traditionally, mathematics has been taught through the conventional chalk-and-talk approach. While convenient, this method poses challenges in terms of visualization and handling complex computations. MATLAB is a powerful tool to overcome these issues. This paper presents a model for the effective integration of technology into the learning experience of a large and diverse group of students in first-semester B.E Course. MATLAB was incorporated into the curriculum and mathematical concepts delivered in class were practically demonstrated using MATLAB. At the end of the semester, student feedback was collected. These aspects are discussed in detail in this paper. The findings of this study provide insights for institutions intending to establish a Mathematics laboratory.

**Full paper; Studies in Science of Science, DOI: https://sciencejournal.re, Vol 43, Issue No. 9 2025, pp 37-45.*

Optimizing the Fiber-Matrix Ratio of Ice Apple Husk Fiber-Reinforced Polyester Composites to Enhance the Mechanical Property

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ABSTRACT

The present study focuses on optimizing the fiber-matrix ratio of Ice Apple husk fiber-reinforced polyester composites to enhance mechanical properties. Using a retting process to extract the fibers, we fabricated composites with fiber-to-matrix ratios of 1:30, 1:40, 1:50, 1:60, and 1:70 using polyester resin. By following the ASTM standards the mechanical testing, including tensile, flexural, and compression strength analysis, was done. The results revealed that the mechanical properties such as tensile and flexural strength, vary significantly with the fiber-to-matrix ratio. Tensile strength was highest for the 1:70 ratio composite (19.37 MPa), and flexural strength was higher for the 1:50 ratio composite (68.5 MPa). There was little difference in compressive strength ranging from 21.38 to 22.28 MPa. These findings highlight the potential of Ice Apple husk fibers as a sustainable reinforcement material for composites. Additional research using these specific ratios will facilitate performance improvements and broaden their applications in sustainable material development.

**Full paper: AIP Conference Proceedings, DOI: https://doi.org/10.1063/5.0298910, Vol 3361, Issue No. 1, 2025.*

Thermal Characterization of Sustainable Areca Husk Fibre Reinforced Polyester Composites for Insulation

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ABSTRACT

This paper investigates the development of a sustainable and high-performance material for thermal insulation, leveraging Areca Husk Fibre (AHF), an abundant agricultural by-product, as reinforcement in an Unsaturated Polyester Resin (UPR) matrix. This study aimed to optimize the fibre-to-matrix ratio to maximize thermal resistance. Five different compositions were fabricated and characterized using the Lee's disc method. The results show a clear dependence of thermal conductivity on the composition. Crucially, the 1:40 (AHF:UPR) ratio was identified as the optimal formulation, exhibiting the lowest thermal conductivity value recorded at 0.0357 W/mK. In conclusion, this optimized 1:40 ratio composite is validated as a cost-effective, environmentally friendly, and highly competitive thermal insulator with regards to biocomposites. It presents an ideal sustainable alternative for use in nonstructural thermal management applications across the automotive and construction industries.

**Full paper: International Journal of Applied Research, DOI: https://www.doi.org/10.22271/allresearch.2025.v11.i11Sa.13048, Vol 11, Special Issue No. 11, 2025, pp 68-72.*

Reimagining Engineering Education through the Lens of Complexity Science: A Systems Approach to Embedding the UN SDGs

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ABSTRACT

Engineering education is at a pivotal juncture, faced with the urgent need to respond to complex global challenges as articulated in the United Nations Sustainable Development Goals (UN SDGs). Traditional curricula, often grounded in linear and reductionist models, are insufficient to prepare students for the dynamic, interconnected systems they will encounter in professional practice. This article explores how complexity science and systems thinking can serve as transformative lenses for restructuring engineering education. By embedding the SDGs into course design, project work, and assessment practices, institutions can cultivate engineers who are not only technically competent but also ethically grounded and systemically aware. We propose a curriculum model that integrates interdisciplinary learning, project-based pedagogy, and stakeholder engagement, supported by institutional and faculty development. The article emphasizes the importance of treating SDGs not as ancillary topics but as integral design constraints and educational drivers. This reimagined approach aligns engineering education with its deeper purpose: to co-create sustainable, equitable solutions for a complex world.

Full paper: YMER, DOI: 10.37896/YMER24.06/A3 Vol 24, Issue No.6, 2025, pp 1016-1024.

Thiazole Sulfonamide Derivatives: Synthesis, Characterization, Biological Evaluation and Computational Study

Fernandes Sheetal[1], Kudva Jyothi[1], Lahtinen Manu[2], Sunil Kumar A[3], Sajankila Shyama Prasad[4], Goveas Santhosh[5], Mukherjee Arnab[6], Naral Samodara[7]

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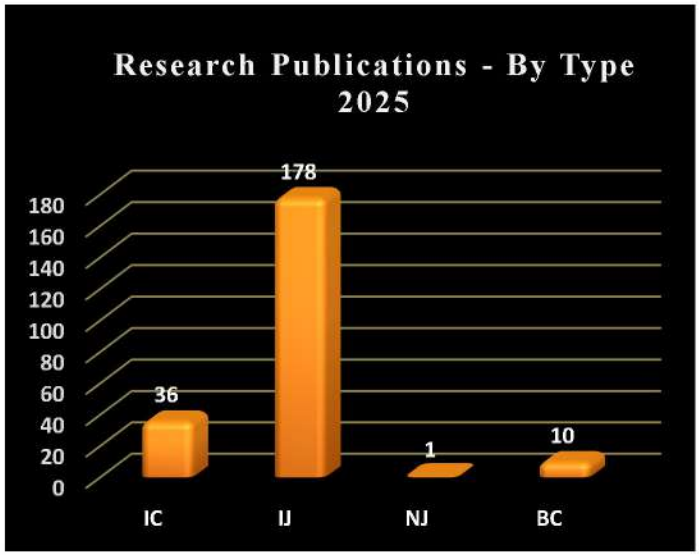
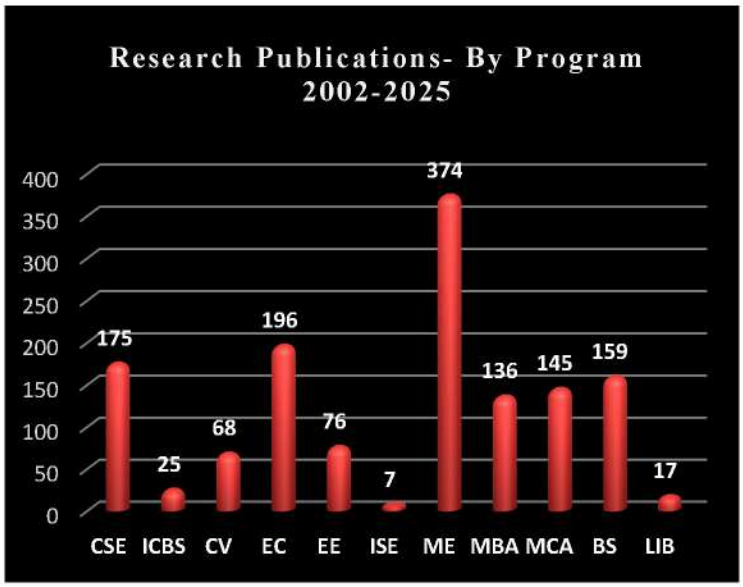
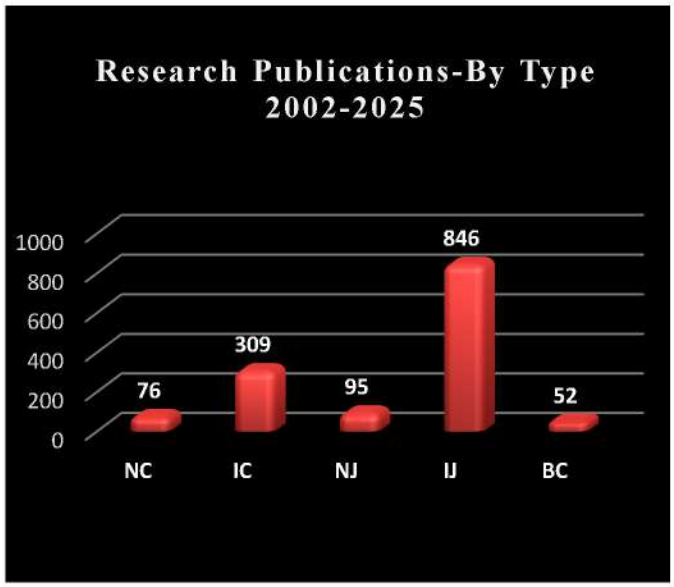
ABSTRACT

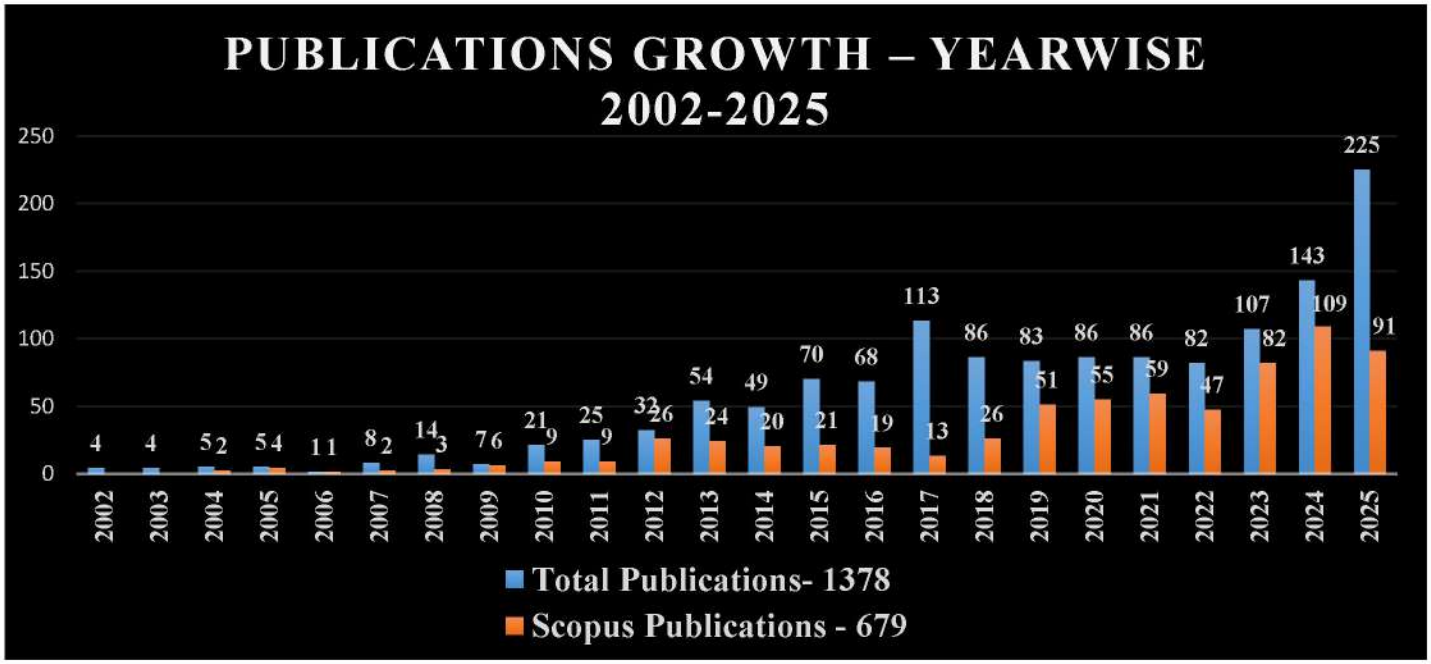
Emerging infectious diseases in which pathogens resist existing treatments require novel and efficient drugs. The exploration of potential drugs is necessary to improve global public health. Hence, in this study seven new 2,4,5 -trisubstituted thiazole derivatives bearing sulfonamide moieties were synthesized, and characterized for the in vitro anticancer, antitubercular, and antibacterial activities. Density functional theory (DFT) and molecular docking analyses were performed to interpret the molecular mechanisms contributing to biological activities. The novel compounds showed potential anticancer activity against the human lung carcinoma cell line A549. Compound 7f (N-(4-fluorophenyl)-2-(4-fluorophenylsulfonamido)-4-methylthiazole-5-carboxamide) exhibited remarkable anticancer activity at 4.69 µg/mL concentration and has been proposed as a possible therapeutic choice for drug-resistant cancers. Compounds 7a–7g displayed modest antibacterial activity with a minimum inhibitory concentration (MIC) of 1.0 mg/ml. Compound 7f was resistant to M. tuberculosis at (MIC) 25.0 µg/mL. Single-crystal X-ray diffraction (SCXRD) study of the compound 7e (2-(4-fluorophenylsulfonamido)-4-methyl-N-phenylthiazole-5-carboxamide) showed that it crystallizes in a monoclinic $P2_1/n$ space group with six molecular moieties in an asymmetric unit. The robustness of ligand-protein interactions was studied using molecular dynamics (MD) simulations. This synergistic blend of experimental and computational approaches yields critical information for the design and advancement of future drug candidates with potent efficacy.

**Full paper: Journal of Molecular Structure, DOI:10.1016/j.molstruc.2025.143184 Vol 1347, Article No. 143184, 2025.*









IC–International Conference, **NC**- National Conference, **IJ**- International Journal, **NJ**- National Journal, **BC**- Book Chapter

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