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Editors

PROCEEDINGS OF NATIONAL CONFERENCE ON EMERGING TRENDS IN ENGINEERING AND MANAGEMENT

ETEM-2026

07th - 12th February 2026

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Preface

It is with great pleasure that we present the Proceedings of National Conference on Emerging Trends in Engineering and Management (ETEM)-2026. This book is a collection of selected papers that were presented at the conference and serves as a valuable resource for researchers, academicians, professionals, and students alike.

The ETEM conference is a platform for scholars and experts from various fields to come together and exchange ideas, discuss new research findings, and collaborate on innovative solutions to emerging challenges in their respective areas of expertise. The conference saw an overwhelming response from researchers and scholars from across the globe, who shared their latest research work and insights on diverse topics.

The papers presented in this conference cover a wide range of topics, including but not limited to artificial intelligence, computer science, environmental science, material science, and social sciences. These papers offer a glimpse into the latest trends, innovations, and breakthroughs in these areas, and provide valuable insights into the future directions of research.

We would like to thank all the contributors who submitted their work and made ETEM 2026 a grand success. We would also like to express our gratitude to the reviewers and editors who rigorously evaluated each paper and ensured that only the highest-quality work made it to the final publication.

We hope that this book will serve as a valuable reference for researchers and professionals and will inspire further research and collaboration in the fields of science and engineering.

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ETEM-2026

Engineers and scientists are the builders of the nation. They provide basic infrastructure facilities needed for the society. While providing these basic infrastructure facilities, an engineer or scientist is concerned with four aspects, namely, Quality, Productivity, Safety and Economy (QPSE). There has been a noticeable change in the environment within which engineer, or scientist carry out their work. There is a growing concern on the adverse consequences of the sustainable development activities. Global warming and climate change and their impacts on the various sectors of the society are also of major concern. In this changing environment the specifications for meeting the QPSE requirement are becoming more and more complicated. A multitude of threats confront us in our effort to achieve sustainability. Engineers and scientists have always been looking for innovative tools and techniques for solving the challenging problems that they face during planning, analysis, design, and construction of engineering structures. This conference is aimed to provide a forum to all engineers and scientists to deliberate on the innovative tools and techniques that are needed to face the challenge of sustainable development.

All the submitted papers will go through a peer review process and the corresponding authors will be notified. Authors of the selected papers may present their papers during the conference.

Acknowledgements

We would like to express our gratitude and sincerest thanks to **Dr. C. Gangi Reddy, Chairman**-AITK, **Sri. C. Yella Reddy,** Vice- Chairman-AITK, **Sri C. Abhishek Reddy,** Secretary & Correspondent-AITK, whose generous support made this book possible. Their encouragement to advancing research and support in the field is greatly appreciated.

We would like to thank **Prof. A. Sudhakara Reddy,** Principal-AITK, has monitored whole activity of this conference from beginning till its successful end.

We would like to thank the contributors whose insightful and thought-provoking research forms the foundation of this book. Their research, ideas, and expertise have contributed immensely to the development of the field and will undoubtedly inspire new avenues of inquiry.

We would also like to extend our appreciation to the reviewers who provided valuable feedback and guidance on the book. Their critical insights and suggestions have helped us ensure the quality and rigor of the book.

We would like to thank the editorial and production team who worked tirelessly behind the scenes to bring this book to fruition. Their hard work, dedication and attention to detail have resulted in a high-quality publication that we are all proud of.

We are deeply grateful all those who made the publication of this book possible

We hope that the book will stimulate the new thinking, spark innovative ideas and contribute to ongoing discussions and debates in the field.

Once again, thank you to everyone involved in the making of this book. We hope that you find it informative, engaging, and thought-provoking.

Sincerely,
Organizing Chairs
ETEM 2026

Dr. C. GANGIREDDY

Hon'ble Secretary

Annamacharya Educational Trust

MESSAGE

It gives me overwhelming joy to best of my best wishes and undeniably great pleasure that the Annamacharya Institute of Technology & Sciences-KADAPA which is a premier establishment in the field of education, is organizing Proceedings of National Conference on Emerging Trends in Engineering and Management "ETEM 2K26" on 7th to 12th FEBRUARY 2026. It is a premier Centre for imparting excellent education in a variety of courses at Undergraduate, Post-Graduate levels. I am quite sure that the Conference will provide a common platform for deliberations and discussions which would lead to mutual progress and development in Academic and Research. It is worth praising that, within Thirteen years of inception, this institution has crowned many technical quality-oriented feathers in its Glory.

I am sure that this promising global event will be another milestone of AITS KADAPA. I wish that this event will be another benchmark that stands as a symbol of academic Virility of the college. I wish this National Conference to be a grand successful event.

(Dr. C. GANGI REDDY)

Dr. A. SUDHAKARA REDDY

Principal

MESSAGE

It is my privilege to express that **AITS-KADAPA** is marching ahead to organize Proceedings of National Conference on Emerging Trends in Engineering and Management "ETEM 2K26" on 7th to 12th FEBRUARY 2026. In this Technical era, Symposium of this sort are becoming essential and very much helpful for the development of students of various departments and definitely leads a way to amplify the learning skills of students efficiently and effectively. It is an immense pleasure for me to be a part of such knowledge-oriented program organized in this institution, AITS**-KADAPA**.

I congratulate all the team members for their efforts in organizing such an event which will enhance the technical awareness of all the participants from various colleges.

I am confident that the deliberations among the galaxy of distinguished and young minds will be fruitful. This National Level Students Technical Symposium will be another stepping stone of success for this institution. I take this opportunity to congratulate the Students, Faculty and Non-Teaching staff of all the departments for organizing "Proceedings of National Conference on Emerging Trends in Engineering and Management "ETEM 2K26" on 7th to 12th FEBRUARY 2026. I am joyful for wishing this Conference a grand success.

(Dr. A. SUDHAKARA REDDY)

Dr. P.V.S Murali Krishna

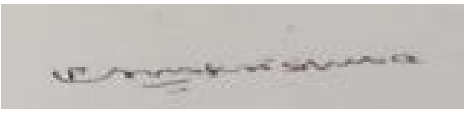
Professor and Head of the Department

Electronics and Communication Engineering

MESSAGE

On behalf of the Department of Electronics and Communication Engineering, it is my great privilege and prestigious moment to organize the 3rd Proceedings of National Conference on Emerging Trends in Engineering and Management ETEM– 2K26. The areas that have been chosen for presentation of papers are very essential in our day-to-day life. I am confident that this conference will emphasize on existing multidisciplinary areas of Electronics and Communication Engineering that counter the technological challenges of the current century and will provide a forum for integrating the knowledge and experience from experts of different fields.

The ETEM–2K26 program is a perfect time for us to introspect on both our achievements and failures as it showcases our current research and advancements in the field of Electronics and Communication Engineering. I would like to express my special thanks and appreciation to all the faculty and students of Department of E.C.E. in organizing ETEM–2K26 on 7th February and making this event a grand success.



(Dr. P. V. S Murali Krishna)

Dr. M. Murali Mohan Naik
Head of the Department
Mechanical Engineering

MESSAGE

Mechanical Engineering is an exciting, growing and challenging field that has vast impact on daily life. Our department working to produce rich blend of competent, technical and managerial, social skills and contribute to nation build. The department has well qualified and high experienced dedicated faculty with effective research-oriented teaching learning process. Department is wide open to innovative ideas and methodologies as excellent learning centre. The excellent infrastructure and teaching faculty of the Department ensuring quality education such interaction among students, parents and staff, along with a Training and Placement Cell ensures a bright future to its students.

As HOD I wish to take the opportunity to congratulate the students, Teaching and Non-Teaching staff of the department for organizing "Proceedings of National Conference on Emerging Trends in Engineering and Management "ETEM 2K26" on 7th February 2026". It's my privilege in wishing the Conference a grand success.

(Dr. M. Murali Mohan Naik)

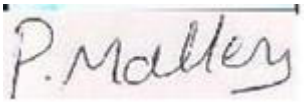
Dr. P. Malleswara Reddy
Head of the Department
Electrical and Electronics Engineering

MESSAGE

On behalf of Electrical and Electronics Engineering department, it is my great honour and pleasure to bring out this message on the occasion of Proceedings of National Conference on Emerging Trends in Engineering and Management "ETEM 2K26" on 12th February 2026. This Conference has been continued as a tradition of being the premier forum for presentation of results and experience reporting on leading edge issues concerning recent research and importing the latest technical knowledge to the students.

The mission of the Conference is to share novel ideas as well as practical applications in the area of Electrical Engineering, in addition to identify new directions for future research and developments. "**ETEM 2K26**" is such a Conference which provides unique opportunities for young engineers, researchers and entrepreneurs to grow themselves technically. The main objective of this Conference is to create platform for students to come out with new ideas in technical area and share their knowledge.

As a Head of the Department of Electrical and Electronics Engineering, I appreciate the efforts of faculty members, supporting staff and students in organizing excellent Proceedings of National Conference on Emerging Trends in Engineering and Management "ETEM 2K26" on 12th February 2026, and I wish each of them to have successful Conference. I am very much thankful to each and every student participant. I personally thank the Management and the Principal for providing the required sources for conducting such a wonderful event.



(Dr. P. MALLESWARA REDDY)

Dr. C. VENKATA SUBBAIAH

Head of the Department

Computer Science and Engineering

MESSAGE

Computer Science and Engineering is an exciting, growing and challenging field that has vast impact on daily life. Our department working to produce rich blend of competent, technical and managerial, social skills and contribute to nation build. The department has well qualified and high experienced dedicated faculty with effective research-oriented teaching learning process. Department is wide open to innovative ideas and methodologies as excellent learning center. The excellent infrastructure and teaching faculty of the Department ensuring quality education such interaction among students, parents and staff, along with a Training and Placement Cell ensures a bright future to its students.

As HOD I wish to take the opportunity to congratulate the students, Teaching and Non-Teaching staff of the department for organizing "Proceedings of National Conference on Emerging Trends in Engineering and Management "ETEM 2K26" on 11th February 2026". It's my privilege in wishing the Conference a grand success.

(Dr. C. VENKATA SUBBAIAH)

Dr. M. VENKATA RAMANA
Head of the Department
Artificial Intelligence and Data Science

MESSAGE

Artificial Intelligence & Data Science is an exciting, growing and challenging field that has vast impact on daily life. Our department working to produce rich blend of competent, technical and managerial, social skills and contribute to nation build. The department has well qualified and high experienced dedicated faculty with effective research-oriented teaching learning process. Department is wide open to innovative ideas and methodologies as excellent learning centre. The excellent infrastructure and teaching faculty of the Department ensuring quality education such interaction among students, parents and staff, along with a Training and Placement Cell ensures a bright future to its students.

As HOD I wish to take the opportunity to congratulate the students, Teaching and Non-Teaching staff of the department for organizing "Proceedings of National Conference on Emerging Trends in Engineering and Management "ETEM 2K26" on 11th February 2026". It's my privilege in wishing the Conference a grand success.

(Dr M. VENKATA RAMANA)

Dr. O. HOMA KESAV
Head of the Department
CSE (Artificial Intelligence & Machine Learning)

MESSAGE

CSE (Artificial Intelligence & Machine Learning) is an exciting, growing and challenging field that has vast impact on daily life. Our department working to produce rich blend of competent, technical and managerial, social skills and contribute to nation build. The department has well qualified and high experienced dedicated faculty with effective research-oriented teaching learning process. Department is wide open to innovative ideas and methodologies as excellent learning centre. The excellent infrastructure and teaching faculty of the Department ensuring quality education such interaction among students, parents and staff, along with a Training and Placement Cell ensures a bright future to its students.

As HOD. I wish to take the opportunity to congratulate the students, Teaching and Non-Teaching staff of the department for organizing "Proceedings of National Conference on Emerging Trends in Engineering and Management "ETEM 2K26" on 11th February 2026". It's my privilege in wishing the Conference a grand success.

(Dr. O. HOMA KESAV)

Dr. G. RAMANJANEYULU

Head of the Department

Master of Business Administration

MESSAGE

Master of Business Administration is an exciting, growing and challenging field that has vast impact on daily life. Our department working to produce rich blend of competent, technical and managerial, social skills and contribute to nation build. The department has well qualified and high experienced dedicated faculty with effective research-oriented teaching learning process. Department is wide open to innovative ideas and methodologies as excellent learning center. The excellent infrastructure and teaching faculty of the Department ensuring quality education such interaction among students, parents and staff, along with a Training and Placement Cell ensures a bright future to its students.

As HOD I wish to take the opportunity to congratulate the students, Teaching and Non-Teaching staff of the department for organizing "Proceedings of National Conference on Emerging Trends in Engineering and Management "ETEM 2K26" on 10th February 2026". It's my privilege in wishing the Conference a grand success.

(Dr. G. Ramanjaneyulu)

Smt. SUREKHA

Head of the Department

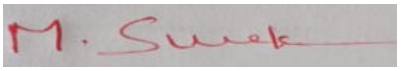
Master of Computer Applications

MESSAGE

On behalf of Master of Computer Application Department, it is my great honour and pleasure to bring out this message on the occasion of Proceedings of National Conference on Emerging Trends in Engineering and Management "ETEM 2K26" on 10th February 2026. This Conference has been continued as a tradition of being the premier forum for presentation of results and experience reporting on leading edge issues concerning recent research and importing the latest technical knowledge to the students.

The mission of the Conference is to share novel ideas as well as practical applications in the area of Computer Application, in addition to identify new directions for future research and developments. "**ETEM 2K26**" is such a Conference which provides unique opportunities for young engineers, researchers and entrepreneurs to grow themselves technically. The main objective of this Conference is to create platform for students to come out with new ideas in technical area and share their knowledge.

As a Head of the Department of Master of Computer Application, I appreciate the efforts of faculty members, supporting staff and students in organizing excellent Proceedings of National Conference on Emerging Trends in Engineering and Management "ETEM 2K26" on 10th February 2026, and I wish each of them to have successful Conference. I am very much thankful to each and every student participant. I personally thank the Management and the Principal for providing the required sources for conducting such a wonderful event.



(Smt. Surekha)

CONTENTS

COMPUTER SCIENCE AND ENGINEERING

AUTOMATED HELMET AND PLATENUMBER DETECTIONUSING DEEPLEARNING

S.Sumaya[1] Assistant Professor, Dept of AIML, sumayyashaik1418@gmail.com
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ABSTRACT

Road traffic safety remains a major public health concern, particularly in developing countries where two-wheelers constitute a significant share of daily transportation. A large proportion of fatal motorcycle accidents are attributed to the non-usage of helmets, despite strict legal mandates. Manual enforcement of helmet laws is labor-intensive, inconsistent, and impractical in high-density traffic environments. Additionally, reliable identification of violators requires accurate license plate recognition under challenging real-world conditions such as varying illumination, occlusion, motion blur, and non-standard plate formats.This paper presents an automated deep learning–based framework for real-time helmet detection and license plate recognition (LPR). The proposed system employs a YOLO-based object detection model to classify riders into helmet and no-helmet categories. For detected violations, a dedicated license plate detector localizes the vehicle registration plate, followed by image preprocessing techniques including perspective correction and contrast enhancement. Optical Character Recognition (OCR) using Tesseract, combined with rule-based validation, is applied to extract structured alphanumeric plate information.Experimental evaluation on benchmark datasets and custom Indian traffic data demonstrates promising performance. The system achieves approximately 95% accuracy in helmet detection**,** 92% license plate localization IoU, and88–92% OCR accuracyunder varied environmental conditions. The integrated pipeline operates at 20–28 frames per second**,** confirming its suitability for real-time traffic surveillance. The proposed framework can be effectively deployed for automated traffic enforcement, smart city infrastructure, toll management, and intelligent transportation systems.

Keywords:
Helmet Detection, Automatic Number Plate Recognition, YOLOv5, Deep Learning, Computer Vision, Traffic Monitoring, Smart Cities Helmet Violation Detection, License Plate Recognition, Deep Learning, OCR, Traffic Law Enforcement, Smart Transportation

REAL-TIME ABNORMAL EVENT DETECTION IN PEDESTRIAN PATHWAYS

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ABSTRACT

Nowadays, pedestrian pathways are used by many people, and safety has become a concern in crowded areas. In general, most surveillance systems depend on people watching the cameras, which is not always effective. During normal observation, it is easy to miss unusual activities when there are many movements happening at the same time. Because of this reason, the idea of automating abnormal event detection was considered in this project. This project works on identifying abnormal events using deep learning techniques. A CNN model based on VGG16 is used to analyze images captured from surveillance cameras. Transfer learning is applied so that the model can learn faster and give better results with limited data. The system is implemented using the Django framework, where users can upload images and receive predictions. From the obtained results, it can be observed that the system performs better than manual monitoring and helps reduce human effort.

Keywords: Pedestrian Surveillance, Abnormal Activity Detection, Deep Learning Approach, Convolutional Neural Network, Image Classification, VGG16, Real-Time Monitoring

DEEP LEARNINGBASEDPARCEL DAMAGE DETECTION USING COMPUTER VISION FOR SHIPMENT QUALITY ASSESSMENT

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Shajiyap[2] Yashwitha P[3] Sharandeep Reddy B[4]Nithesh N[5]
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ABSTRACT

Over the last few years, the accelerated development of e-commerce and logisticsservices made the quality of shipment more significant. During transportation, parcels are damaged and this results in loss of money, unsatisfied customers and inefficiencies in the operations. The process of the manual inspection of parcels is time-consuming, error prone and cannot be implemented in large-scale logistics settings. To solve these problems, the proposed project will suggest a deep-learning-based parcel-damage classification system based on the current abnormal eventdetection models. The Convolutional Neural Network (CNN) with transfer learning is employed to classify by itself (without human intervention) parcel images as damaged and non-damaged, and into various degrees of the severity of the damages. The results of the experiment indicate that the system is effective and can be implemented in the logistics processes of the real-time.

Keywords: Parcel Damage Detection, Deep Learning, Computer Vision, CNN, VGG16, Logistics Automation.

CROP STRESS ANALYSIS AND DETECTION USING DEEP LEARNING

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Lakshmi Prasanna N[2]Lavanya A[3]Rohith Kumar P[4]Nithin Krishna M[5]
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ABSTRACT

The agri- food assiduity provides the foundation of global profitable stability and food security. nonetheless, a variety of factors can negatively impact the productivity of food crops. Crop stress is the miracle which inhibits shops from completing their life cycle. Crop stress can do as a result of inadequate water and nutrients, factory complaint, pest attack, and, indeed, extreme rainfall. Delayed recognition of crop stress can lead to significant profitable losses and declination in the quality of crops. The traditional crop monitoring approaches calculate on the homemade examination of the fields and the knowledge of specialists. similar approaches are veritably tedious and aren't applicable to large areas. also, they tend to descry stress symptoms only after the damage is visually significant and heavily economically damaging. To break these issues this design has put forth a deep literacy grounded crop stress discovery which uses image analysis. We've put together a system which uses thermal images of crops to identify temperature oscillations and visual signs of factory stress. We made use of Deep literacy models in particular Convolutional Neural Networks(CNNs) which are suitable to prize features from the images and bracket of crops into health or stress orders without the need for homemade point engineering. The system we have put forward is a Django grounded web app which we've made veritably simple and easy to use. druggies may upload crop images via the web app and get real time reports of crop health. This early discovery we hope will beget timely action and proper intervention. The whole proposed method improves the delicacy of discovery, minimizes mortal input, and we anticipate a decrease in crop loss. Abedarist's improvement of primordial research facilitates the creation of new activities in diverse fields. In our proposed system, the delicacy of discovery is enhanced, and mortal working conditions are minimized, and the crops are safeguarded from loss of delicacy. Our proposed system helps in the early identification of factory stress, which helps in improving agrarian productivity and sustainable husbandry practices.

Keywords: Crop Stress Detection, Deep Learning, Convolutional Neural Network (CNN), Thermal Imaging, Early Prediction.

BENEFITS, CHALLENGES AND PROSPECTS OF CNN AND TRANSFER LEARNING IN MEDICAL IMAGING ANALYSIS

Shaik ShameenTazAssist Professor,Dept of AIML,AITS,TirupatiShameen2718@gmail.com

ABSTRACT

The phrase "computer vision" is being used more and more in relation to image processing. The necessity for automated object detection has grown significantly with the advancement of AI capabilities. In a variety of fields, including as speech recognition, object recognition, natural language processing, video processing, and picture classification and segmentation, deep neural network models built around convolution, or CNNs, have achieved impressive advancements. This has helped the field of computer vision. Additionally, a plethora of data and easily accessible tools provide new opportunities for CNN research. Among the intriguing ideas that have been investigated for CNN's prospective growth include regularization, alternative activation coefficients, efficiency-maximizing settings, and design improvements. Additionally, a willingness provided by the deeper CNN is significantly increased upon achieving architectural improvements. The use of route, geographical when and several paths analysis with a deep design has received a lot of attention.a number of recent advancements in CNN architectures are divided into eight areas, with a focus on the primary taxonomy and recently published deep CNN designs. The eight categories are feature-map exploitation, channel boosting, multi-path, spatial exploitation, depth, breadth, dimension, and attention-based CNN. The primary contribution is a comparative study of CNN's architectural developments, taking into account their differences, advantages, and disadvantages. The CNN's components, the benefits and drawbacks of different CNN variants, as well as any open questions or research gaps are also covered.

Keywords: CNN, Image processing, Multi path, NLP

OPTIMIZED HANDLING OF IMBALANCED HEALTH INSURANCE FRAUD DATA USING META – REINFORCEMENT LEARNING

Dr. M Venkata Ramana[1] S Siva Ganga[2], G Bala Dinesh Reddy[3], O Manjunath Raju[4], K Srikanth Achari[5], N Divya[6]
[1,2,3,4,5,6] Department of Artificial Intelligence and Data Science, Annamacharya Institute of Technology & Sciences, Kadapa District, Andhra Pradesh-516003.

ABSTRACT

Data imbalance is a major challenge in health insurance fraud detection because fraudulentcases are extremely rare compared to genuine ones, which makes many models focus more on common cases and ignore the rare fraud patterns. To manage this situation, Meta Reinforcement Learning (Meta-RL) is used as a flexible method that can be learned even when very few fraud samples are available. Meta-RL uses meta-learning ideas to quickly understand how fraud behaves by learning shared features and adjusting to each small task without needing many examples. It works with task groups and reward settings, and methods like RL² and VariBAD show strong learning ability across different levels of uneven data. These methods help the system pick up useful signals from very small fraud examples and respond better in changing conditions. Measures such as Geometric Mean, Harmonic Mean, MCC, and Cohen's Kappa are used to check how steady and trustworthy the system is, and these measures help in seeing whether the system can catch rare fraud cases without giving extra weight to common ones. Meta-RL supports fraud detection by learning clear patterns, reducing mistakes, and staying stable across different test situations. It also makes the process more adaptive by allowing the model to learn from earlier tasks and use that experience to handle new tasks more effectively. This helps in building a system that can manage challenging fraud settings where very few fraud examples are available, making it more suitable for real-world health insurance data where the difference between genuine and fraudulent cases is very high.

Keywords: Meta-Reinforcement Learning, health insurance fraud,rare fraud cases,unevendata,meta-learning, RL2, VariBAD,Geometric Mean, Harmonic Mean, MCC,Cohen's Kappa, fraud detection.

AIRQUANET: A PREDICTIVE MODEL FOR AIR QUALITY AND HEALTH RISK ASSESSMENT USING MULTI-SCALE CNN AND SELF-ATTENTION

P Parimala Kumari[1] G Rupasree[2], K Reshma[3], S Masthan[4], O Mahendra[5], Y Sumalatha[6]
[1,2,3,4,5,6] Department of Artificial Intelligence and Data Science, Annamacharya Institute of Technology & Sciences, Kadapa, Kadapa District, Andhra Pradesh-516003

ABSTRACT

AirQuaNet is a convolutional neural network model designed for air quality based health impact prediction by integrating multi-scale convolutional blocks, residual connections, and self-attention mechanisms. The model processes air quality parameters such as PM2.5, PM10, NO_2, SO_2, O_3, and meteorological factors including temperature, humidity, and wind speed to learn complex nonlinear relationships between environmental conditions and health outcomes. Multi-scale convolutional blocks employ parallel one-dimensional convolutional layers with different kernel sizes to extract features at multiple temporal scales, while residual connections improve gradient flow and convergence during training. The self-attention mechanism enables the network to capture long-range dependencies and focus on informative pollutant features. The architecture supports both regression-based health impact score prediction and classification of health impact levels, demonstrating high accuracy, robustness, and generalization across diverse datasets.

Keywords: Air Pollution, Health Impact Prediction, Deep Learning, AirQuaNet, Multi-Scale Convolution, Residual Connections, Self-Attention Mechanism, Multi-Scale Attention Modules (MSAM), Environmental Data Analysis, Machine Learning, Air Quality Monitoring.

PHISHINGGNN: PHISHING EMAIL DETECTION USING DISTILBERT FEATURE EXTRACTION AND GRAPH ATTENTION NETWORKS

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ABSTRACT

Phishing emails are fraudulent messages designed to trick users into revealing sensitive information. PhishingGNN uses two advanced deep learning techniques: DistilBERT to understand email content and Graph Attention Networks to analyze relationships between words and structural elements. By converting each email into a graph, the model captures subtle phishing patterns that traditional methods often miss. Experimental results on a large dataset show near-perfect performance, and strong results on an additional dataset confirm the reliability of the approach. Conventional phishing detection methods mainly rely on basic features such as URLs, keywords, or simple text patterns, which limits their ability to detect personalized attacks. Many existing models also struggle with unseen data due to poor generalization and limited feature understanding. PhishingGNN overcomes these limitations by combining contextual text understanding with graph-based relationship analysis. This hybrid approach is efficient, scalable, and effective against evolving phishing threats, making it suitable for real-world deployment.

Keywords: PhishingGNN, DistilBERT, Graph Attention Networks, URL, Feature Extraction, Graph based representation.

LEVERAGING DEEP LEARNING TO TRANSFORM RAW HEALTH DATA INTO OBESITY

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ABSTRACT

Obesity has become a major global health concern due to rapid lifestyle changes, unhealthy dietary habits, and reduced physical activity. The increasing prevalence of obesity significantly raises the risk of chronic diseases such as diabetes, cardiovascular disorders, and metabolic syndromes. Early and accurate prediction of obesity is essential for effective prevention and healthcare planning Existing obesity prediction systems primarily employ traditional machine learning algorithms such as Logistic Regression, Decision Trees, Support Vector Machines, k-Nearest Neighbors, and Multi-Layer Perceptron (MLP) networks. While these approaches deliver acceptable predictive performance, they often struggle to effectively model high-dimensional data and capture complex, non-linear relationships among health-related attributes. To address these limitations, this work proposes an advanced deep learning–based obesity prediction framework that integrates supervised autoencoders with an MLP classifier. The supervised autoencoder enhances feature representation by learning discriminative and compact latent features, while the MLP leverages these features for accurate classification. Experimental results demonstrate that the proposed hybrid model outperforms existing machine learning and standalone MLP approaches in terms of prediction accuracy, robustness, and generalization capability, making it a reliable solution for obesity risk assessment.

Keywords: Obesity Prediction, Supervised Autoencoders, Deep Multi-Layer Representation.

ESTIMATING JOB MARKET DEMAND VIA TEXT EMBEDDINGS OF PATENT TAXONOMIES AND OCCUPATIONAL PROFILES

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ABSTRACT

Rapid changes in technology have made it difficult for students and job seekers to clearly understand which skills and roles are truly in demand in the job market. As new technologies emerge, the gap between technological innovation and workforce readiness continues to grow, leading to skill mismatch and uncertain career planning, especially among youth.To overcome this challenge, our project presents a job market demand estimation approach that links technological advancements with occupational requirements. The system uses patent data from the United States Patent and Trademark Office (USPTO) and occupational profiles from O*NET as inputs. By applying Word2Vec and BERT text embedding models, patent descriptions and job task descriptions are converted into semantic vectors. These embeddings enable meaningful comparison between technologies and job roles, allowing the system to identify how closely occupations align with emerging technological trends.Unlike traditional methods that rely on keyword matching or verb–noun extraction, which often miss context and semantic meaning, embedding based models capture deeper relationships between skills, tasks, and technologies. This results in more reliable estimation of job demand driven by technological change.The outcomes of this project are particularly valuable for students, fresh graduates, career counselors, educational institutions, and policymakers, helping them make informed decisions on skill development and future workforce planning.

Keywords: Job demand,Patentdata,Occupatonaldata,Text Embedding models, USPTO,O*NET,Word2Vec, BERT,SemanticVectors,Key Word and Verb-Noun Matching.

ADVANCED CYBERATTACK DETECTION IN CYBER PHYSICAL SYSTEM (CPS) USING OPTIMIZED DEEP LEARNING

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ABSTRACT

An advanced cyber attack detection framework for Cyber Physical Systems using optimized deep learning techniques. The intended system introduces an end to end intrusion detection architecture that integrates data preprocessing, feature selection, deep learning based attack detection, and real time alert generation to enhance CPS security. An Arithmetic Optimization Algorithm is employed to perform efficient feature selection and hyperparameter tuning, enabling the model to identify the most relevant and discriminative features while reducing dimensionality and computational complexity. The optimized feature set is processed by deep learning models such as Convolutional Neural Networks, Long Short Term Memory networks, or hybrid architectures to learn complex spatial and temporal attack patterns present in CPS data. This design enables accurate detection of both known and unknown cyber attacks across diverse CPS environments. A dedicated alert and response module generates real time notifications and logs detailed attack information, supporting rapid mitigation and maintaining system reliability. The proposed framework achieves improved detection accuracy, reduced false alarm rates, enhanced adaptability to evolving threats, and efficient real time performance. The system is suitable for securing large scale CPS applications including smart grids, industrial control systems, and transportation systems, where reliable cyber attack detection is critical.

Keywords: Cyber Physical Systems, Cyber Attack Detection, Optimized Deep Learning, Arithmetic Optimization Algorithm, Intrusion Detection System, Feature Selection, CPS Security

DEEP-LEARNING APPROACH FOR AN ANALYSIS OF REAL-ESTATE PRICES AND TRANSACTIONS

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ABSTRACT

The rapid growth of urbanization, expanding infrastructure, and rising demand for residential and commercial properties have made accurate real estate price estimation essential. Traditional valuation methods often depend on manual analysis, broker opinions, and subjective judgment, which can lead to inconsistent and unreliable price estimates. To address these limitations, this project proposes a Deep Learning–based Real Estate Price and Construction Cost Prediction System using Artificial Neural Networks (ANN) to provide accurate and data-driven price predictions. The system consists of two major prediction modules: land price prediction and construction cost prediction. Land price prediction considers important factors such as state, district, land area, soil type, and land characteristics to analyze the impact of geographical and environmental conditions on land value. Construction cost prediction focuses on structural parameters such as built-up area, number of bedrooms, bathrooms, and the age of the property, enabling precise estimation of construction expenses. A user-friendly web application is developed using the Django framework to collect inputs and display predictions in real time. The system supports secure user authentication, dynamic state district selection, modular templates, prediction history storage, and interactive dashboards for visualization. The trained ANN models ensure reliable and unbiased predictions, and the system is designed to be scalable for future enhancements such as real-time market data integration, GIS-based analysis, and advanced deep learning techniques, offering a modern and intelligent approach to real estate valuation.

Keywords: Real Estate Price Prediction, Land Price Prediction, Construction Cost Estimation, Deep Learning, Artificial Neural Network (ANN), Data-Driven Analytics, Django Web Application.

E- BLOOD BANK: A WEB-BASED BLOOD BANK MANAGEMENT SOLUTION

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ABSTRACT

Modern healthcare systems are built on the compassionate act of blood donation, which entails voluntarily giving a part of oneself to save lives. An overview of the significance of blood donation, its role in medical emergencies, and its long lasting effects on people and communities. Blood donation has effects that extend beyond the immediate medical setting. Communities are strengthened when members band together to support one another, frequently in difficult circumstances. Donating encourages a feeling of fulfillment and empowerment, strengthening the conviction that people can genuinely improve the lives of others. Providing a steady supply of blood for different medical procedures, surgeries, and emergencies, blood donation acts as a lifeline. The selfless and charitable nature of blood donation reflects the social values of empathy and cooperation. For patients in need, such as accident victims, people undergoing complicated surgeries, or people with chronic illnesses, donated blood that has been carefully screened and processed is a vital resource. In conclusion, giving blood is a symbol of humanity's compassion and empathetic nature.

Keywords— Healthcare Technology, Digital Health, Blood Bank Management Systems, Data Management, Automation, Inventory Management Systems

MRI-BASED BRAIN TUMOR DETECTION AND DIAGNOSIS

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ABSTRACT

Brain tumor detection through the assistance of Magnetic Resonance Imaging (MRI) plays an important role in the diagnosis and treatment of the multi-systemic disorder. It is one of the medical image analysis techniques that detect and locate a tumor in one of the most important and sensitive organs: the human brain. This paper proposes an approach to develop an efficient and more accurate deep learning and machine learning based approach to detect and locate a tumor through images captured by an MRI. By using a Convolutional Neural Network (CNN), one of the intelligent deep learning approaches, features of an image and areas of tumors within an image will be automatically extracted. and Support VecctorMachine(SVM), Is used to detect the tumor.Accuracy, precision, recall, and F1-score methods were used to evaluate this approach. Similarly, a graphical interface was added to see images.

Keywords: BrainTumor Detection, MRI, CNN, Deep Learning, Image Segmentation, Medical Image Processing.

SECURE ANONYMOUS FEEDBACK SYSTEM USING BLOCKCHAIN AND CONTROLLED ANONYMITY

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ABSTRACT

Anonymous feedback systems are widely used across organizations and institutions to encourage honest reporting; however, existing solutions often struggle to balance user privacy with accountability. Fully anonymous platforms are susceptible to misuse, while identity-based systems discourage truthful participation and lack transparent governance. This paper presents a Secure Anonymous Feedback System that integrates application-level blockchain techniques with cryptographic identity protection to ensure data integrity, privacy, and accountability. Feedback submissions are secured using SHA-256 hash chaining, forming an immutable ledger capable of detecting unauthorized modifications. User identities are encrypted and remain hidden during normal operation, while a controlled anonymity mechanism allows identity disclosure only to authorized authorities under predefined and auditable conditions. Role-Based Access Control (RBAC) enforces strict separation of privileges, and all sensitive actions are recorded through audit logs. Implemented using the Flask framework and MongoDB, the proposed system provides a flexible and ethical feedback solution applicable across diverse environments, strengthening trust, transparency, and responsible governance.

Keywords: Anonymous Feedback Systems; Controlled Anonymity; Blockchain-Based Data Integrity; Cryptographic Identity Protection; SHA-256 Hash Chaining; Role-Based Access Control; Audit Logging.

HSOMLSDP:AHYBRID SWARM-OPTIMIZED MACHINE LEARNING FRAMEWORK FOR SOFTWARE DEFECT PREDICTION

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This research aims to design a hybrid swarm-optimized machine learning framework for software defect prediction, referred to as HSoMLSDP. Within this framework, a swarm-optimized machine learning defect prediction (SoMLDP) model is developed to improve prediction performance. To enhance the accuracy of the SoMLDP model, this study proposes two novel hybrid swarm optimization algorithms: the Gravitational Force Grasshopper Optimization Algorithm combined with Artificial Bee Colony (GFGOA-ABC) and the Levy Flight Grasshopper Optimization Algorithm combined with Artificial Bee Colony (LFGOA-ABC).

These hybrid algorithms integrate the strong exploration capabilities of GFGOA and LFGOA with the effective exploitation ability of the Artificial Bee Colony (ABC) algorithm. Initially, the performance of LFGOA-ABC and GFGOA-ABC is evaluated using 19 benchmark functions, considering metrics such as mean optimal value, standard deviation, convergence rate, and convergence improvement.

After validating their effectiveness on benchmark functions, the proposed algorithms are applied to optimize the hyperparameters of machine learning models, specifically Artificial Neural Networks and XGBoost, to improve defect prediction accuracy. Experimental results demonstrate faster convergence rates on benchmark functions and significant improvements in software defect prediction accuracy, ranging from 0.01 to 0.28, when tested on NASA defect datasets compared to state-of-the-art methods.

These improvements confirm the effectiveness of the proposed SoMLDP model and validate the overall HSoMLSDP framework.

Keywords: Swarm optimization algorithms, benchmark functions, machine learning, software defect prediction.

HSOMLSDP:AHYBRIDSWARM-OPTIMIZEDMACHINE LEARNING FRAMEWORK FOR SOFTWARE DEFECT PREDICTION

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ABSTRACT

This research proposes a hybrid swarm-optimized machine learning framework for software defect prediction, termed HSoMLSDP. Within this framework, a swarm-optimized machine learning defect prediction (SoMLDP) model is developed to effectively predict software defects. To enhance the prediction accuracy of the SoMLDP model, two novel hybrid swarm optimization algorithms are introduced: Gravitational Force Grasshopper Optimization Algorithm integrated with Artificial Bee Colony (GFGOA-ABC) and Levy Flight Grasshopper Optimization Algorithm integrated with Artificial Bee Colony (LFGOA-ABC).

These hybrid approaches combine the strong exploration capabilities of GFGOA and LFGOA with the efficient exploitation ability of the Artificial Bee Colony (ABC) algorithm, achieving a balanced optimization process. Prior to validating the HSoMLSDP framework, the effectiveness of LFGOA-ABC and GFGOA-ABC is evaluated using 19 benchmark functions, considering metrics such as mean optimal value, standard deviation, convergence rate, and convergence improvement.

Following this validation, the proposed algorithms are applied to optimize the hyperparameters of machine learning models, specifically Artificial Neural Networks and XGBoost, to improve defect prediction accuracy. Experimental results demonstrate faster convergence rates on benchmark functions and significant improvements in software defect prediction accuracy, ranging from 0.01 to 0.28, when evaluated on NASA defect datasets compared to existing state-of-the-art methods.

The observed improvement in accuracy confirms the effectiveness of the proposed SoMLDP model and validates the overall HSoMLSDP framework.

Keywords: Swarm optimization algorithms, benchmark functions, machine learning, software defect prediction.

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COMPARATIVESTUDYOF AUTOMATED TECHNIQUESFOR MULTILABEL SKIN CANCER CLASSIFICATION

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ABSTRACT

Skin cancer is one of the most common and dangerous diseases because many people are unaware of its signs and prevention methods. It ranks as the fourth most burdensome disease worldwide, with death rates increasing significantly. Early detection is crucial to stop the spread of cancer. This paper detects and classifies multi-label skin cancer and implements the best techniques using machine learning and image processing. Preprocessing methods help remove irrelevant and unnecessary features from the label encoder, and standard features are used to standardize the range of functionality by scaling the input variance unit. Additionally, various machine learning techniques were tested to evaluate the performance of each classifier on the HAM10000_metadata dataset. The experimental analysis focused on the HAM10000_metadata dataset, which includes seven different types of skin cancer. The results indicate that machine learning algorithms such as SVM, DT, and GNB achieved the highest accuracy compared to the other classifiers.

Keywords: Skin Cancer, Machine Learning, Deep Learning, CNN, ResNet, DenseNet, Multi-Label Classification, Medical Image

AN AUTOMATED MACHINE LEARNING APPROACH FOR MOBILE APP RATING ESTIMATION

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ABSTRACT

It is still difficult to estimate a mobile application based on its potential success before the release as there would be no actual user feedback. This paper introduces a data-based system of predicting ratings of mobile applications that employs supervised regression methods to make predictions regarding ratings of the products in the initial phases of development. The solution that was proposed uses application metadata, projected review information, and the anticipated installation ranges to come up with rating predictions based on a web-based interface. Django is implemented to facilitate real time interaction and predictive records as a way of analysing the same. The results of experimental evaluation on a large representative data set reveal that the model is a reliable predictor of rating with a high predictive ability and would therefore fit well into a decision-support tool among mobile application developers.

Keywords: MachineLearning,Mobile Applications, Rating Prediction, Forecasting, User Reviews, Data Analysis, Regression- Models

CNN BASED SMART COLLISION PREDICTION AND ALERT SYSTEM USING IOT FOR SUSTAINABLE TRAFFIC SAFETY SAFE TRAX

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ABSTRACT

The rapid growth of vehicular population across urban and semi-urban regions has significantly intensified traffic congestion, accident frequency, and road safety challenges, making conventional traffic monitoring and collision prevention mechanisms increasingly inadequate. In this context, the integration of intelligent systems that leverage Internet of Things (IoT) technologies and advanced machine learning techniques has emerged as a promising solution for enhancing road safety and promoting sustainable transportation systems. This research presents SafeTrax, a smart collision prediction and alert system that utilizes IoT-enabled sensors and deep learning models to proactively identify potential collision scenarios and issue timely alerts to drivers and traffic authorities. The proposed system collects real-time vehicular and environmental data through a network of sensors, including accelerometers, gyroscopes, proximity sensors, and GPS modules, which are continuously transmitted to a centralized processing unit. Unlike traditional rule-based or shallow machine learning approaches, the proposed system employs a Convolutional Neural Network (CNN) to automatically learn complex spatial and temporal patterns associated with collision-prone situations. By enabling early prediction rather than post-accident detection, SafeTrax aims to reduce accident severity, minimize fatalities, and support sustainable traffic safety initiatives. The system's effectiveness lies in its ability to adapt to diverse traffic conditions while maintaining scalability and real-time responsiveness.The proposed SafeTrax system replaces traditional random-based models with a Convolutional Neural Network to enhance collision prediction accuracy and reliability. CNNs are capable of automatically learning hierarchical feature representations directly from raw sensor data, eliminating the need for manual feature engineering. By processing spatial and temporal patterns simultaneously, the CNN-based model can identify subtle indicators of collision risk that are often overlooked by conventional algorithms.

Keywords:
convolutional neural networks (cnn), internet of things (iot), smart traffic safety, collision prediction, defect prediction, intelligent transportation systems (its), deep learning, real-time traffic monitoring, sensor fusion, accident risk analysis, autonomous vehicles, vehicle-to-infrastructure communication, edge computing, traffic anomaly detection, road safety analytics, predictive modeling, machine vision, traffic surveillance, safety-critical systems, sustainable transportation, early warning systems, traffic data analytics, pattern recognition, road condition monitoring, vehicular sensor networks, traffic simulation, cyber-physical systems, mobility safety, decision support systems, smart cities

A MACHINE LEARNING–BASED PLATFORM FOR MONITORING AND PREDICTION OF HAZARDOUS GASES IN RURAL AND REMOTE AREAS

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ABSTRACT

Air pollution caused by hazardous gases presents a serious threat to human health, agriculture, and the environment, particularly in rural and remote areas where monitoring infrastructure is limited or absent. Conventional air quality monitoring systems are expensive, sparsely deployed, and incapable of providing predictive insights necessary for early warning and risk mitigation.This paper proposes a machine learning–based intelligent platform for real-time monitoring and prediction of hazardous gases in rural and remote regions. The system integrates low-cost gas sensors with IoT technology to continuously monitor gases such as carbon monoxide (CO), methane (CH_4), ammonia (NH_3), and nitrogen dioxide (NO_2). Sensor data is transmitted to a cloud platform for preprocessing and analysis. Machine learning models including Random Forest (RF), Support Vector Machine (SVM), and Long Short-Term Memory (LSTM) networks are employed to predict future gas concentration levels and classify hazardous conditions.Experimental evaluation demonstrates prediction accuracy of up to 94%, enabling early warning alerts and proactive environmental safety management. The proposed system is cost-effective, scalable, and suitable for deployment in rural and underserved regions.

Keywords— Hazardous Gas Monitoring, Machine Learning, IoT, Air Quality Prediction, Rural Areas, Environmental Safety

PUBLICPULSE: A SOCIAL MEDIA ANALYSIS FRAMEWORK FOR CITIZEN REACTIONS TO GOVERNMENT ACTIONS

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ABSTRACT

Social media has grown significantly, attracting more people who spend more time on these platforms and share vast amounts of information about their daily lives. Consequently, governments use such social media to disseminate information about their achievements, updated laws, and decisions. Simultaneously, citizens find social media platforms, such as Facebook, X (previously known as Twitter), and Instagram, appealing virtual spaces for expressing their thoughts and opinions. In brief, social media is becoming an increasingly vital channel of communication between governments and citizens. As a result, analyzing social media data to understand and predict public sentiment in the context of government-related events has become increasingly important. While sentiment analysis methods can be employed to mine sentiment from individual posts, estimating collective public sentiment about an event remains challenging. Specifically, sentiment analysis methods are associated with inaccuracies, and a group of individuals may express contradicting opinions about the same event. To address these challenges, we propose a novel framework named "PublicPulse", designed to analyze social media posts and their associated metadata. PublicPulse incorporates a set of sentiment analysis methods along with statistical analysis to generate a public sentiment score for a set of posts related to a specific event. The framework was empirically evaluated using several events of interest to the government in Jordan from 2018 to 2022 and demonstrated accurate results when compared with the historical context of governmental actions.

Keywords: public sentiment analysis, public opinion analysis, social media data, sentiment analysis, governmental decision and actions.

PREDICTING SIDE EFFECT OF DRUG MOLECULES USING RECURRENT NEURAL NETWORKS

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ABSTRACT

Predicting the side effects of drug molecules is important for reducing medical risks and supporting better treatment decisions. Many existing machine-learning and deep-learning models, especially transformer-based approaches, use large and complex architectures that require high computational power, large memory, and long training times, making them difficult to use in low-resource environments. To address this problem, this project proposes a lightweight Gated Recurrent Unit (GRU)–based model for drug side-effect prediction. The GRU, a simplified form of Recurrent Neural Network (RNN), learns useful patterns from molecular sequence data. Compared to large transformer models, the proposed approach reduces model parameters by more than 98% while maintaining good prediction accuracy. The system runs efficiently on standard laptops with low computational cost and shorter training time. Experimental results on multiple datasets show that the model is accurate, stable, and able to generalize well to unseen drug molecules, making it a practical and accessible solution for drug side-effect prediction.

Keywords: Drug Side-Effect Prediction, GRU, RNN, Molecular Sequences, Lightweight Model, Deep Learning, Model Optimization, Computational Efficiency

A MACHINE LEARNINGBASED CUSTOMERCHURN PREDICTION USINGENSEMBLE TECHNIQUES

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ABSTRACT

Customer churn prediction is a critical problem in the telecommunications industry, as customer loss directly affects revenue and long-term business sustainability. Due to highly competitive markets and continuously evolving customer behaviour, traditional churn prediction models often fail to provide reliable results. Many machine learning approaches suffer from issues such as class imbalance, overfitting, and limited generalization on unseen data. To address these challenges, this paper proposes an intelligent ensemble-based customer churn prediction framework that extends the concept of the Evolving Ensemble Predictor (EEP). The proposed approach integrates multiple machine learning models, including Neural Networks, Random Forest, XGBoost, and K-Nearest Neighbors, using a weighted ensemble strategy. To improve minority churn class detection, Synthetic Minority Oversampling Technique (SMOTE) and ADASYN are applied during data preprocessing. In addition, regularization techniques are incorporated to control model complexity and reduce overfitting. The Orange Telecom Churn Dataset from Kaggle is used for experimental evaluation. The proposed framework demonstrates improved prediction accuracy, better recall for churn customers, and enhanced robustness compared to individual models. This study highlights the effectiveness of combining ensemble learning, imbalance handling, and regularization techniques for real-world customer churn prediction.

Keywords: Customer Churn Prediction, Machine Learning, Ensemble Learning, SMOTE, ADASYN, Regularization, Telecommunications

ROBUST SEIZURE PREDICTION MODEL USING EEG SIGNAL FOR TEMPORAL LOBE EPILEPSY LEVERAGING DEEP LEARNING AND CONTINUAL LEARNING

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ABSTRACT

Epilepsy is characterized by abnormal electrical activity in the brain that affects millions worldwide and poses significant challenges to patients and healthcare providers. Seizure prediction has emerged as a pivotal area of research in epilepsy management aiming to mitigate the unpredictability of seizures and enhance patient quality of life. This research focuses on leveraging memory-based learning approaches including transfer learning and recurrent neural networks (RNNs) for seizure prediction. The dataset comprises time-domain signals embedded with noise necessitating preprocessing techniques such as filtering for optimal utilization. By employing deep learning methodologies, the work seeks to classify seizure in temporal lobe epilepsy from the EEG signals to improve seizure prediction accuracy. With deep learning ability to capture temporal dependencies in sequential data, they offer promising avenues for modeling the temporal dynamics of epileptic seizures. Among the performed architecture and their merits when compared to other, ‘‘Googlenet’’ proved to be the best architecture for training the model by achieving the accuracy of 97.5%. Through continual learning strategies, the model’s training process adapts dynamically enabling it to incorporate new information while retaining knowledge from previous tasks. We used ‘‘Elastic Weight Consolidation (EWC)’’ as the continual learning technique which enforces adaptability and robustness of the trained model. With a custom learning rate scheduler that adjust the learning rate during the training based on the current epoch in the EWC technique we enhanced the accuracy to 98.7% which is pretty much promising result. The model improved by 1.2% over the baseline GoogLeNet (97.5%) to reach an accuracy of 98.7% by including Elastic Weight Consolidation (EWC) for continuous learning. When paired with a customized learning rate scheduler, EWC accelerates convergence and improves model adaptability by eliminating catastrophic forgetting.

Keywords: Epilepsy, EEG, deep learning, transfer learning, continual learning, EWC.

EXPLORING THE POWER OF QUANTUM COMPUTING

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ABSTRACT

Quantum computing is an emerging computational paradigm that leverages the principles of quantum mechanics to solve complex problems beyond the practical limits of classical computers. Unlike classical systems that use binary bits, quantum computers use qubits, which can exist in superposition and exhibit entanglement. These properties enable quantum systems to perform parallel computations and enhance problem-solving efficiency for specific tasks such as factorization and search operations. This paper presents the fundamental concepts of quantum computing, including qubits, quantum gates, quantum circuits, and key quantum algorithms. Furthermore, it discusses applications in cryptography, artificial intelligence, drug discovery, and optimization.

Keywords: Quantum Computing, Qubits, Superposition, Entanglement, Quantum Gates, Quantum Algorithms.

A DEEP LEARNING–BASED APPROACH FOR GENDER AND AGE ESTIMATION FROM SPEECH SIGNALS

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ABSTRACT

In this paper, the hypothesis is a hybrid intelligent model of speech-based gender and age estimation technologies based on the integration of deep learning and classical machine learning models. Gender classification is done by deep neural network trained on Mel-spectrogram representation, which is effective in extracting time-frequency features of human speech. In age estimation, a broad category of statistical and spectral examples, including spectral centroid, spectral bandwidth, zero-crossing rate, spectral roll-off, pitch and Mel-Frequency Cepstral Coefficients (MFCCs), will be derived and learned by a Random Forest classifier. The suggested system can analyze the audio files offline and receive the microphone in the real-time, therefore, being implemented in reality. Audio signal processing such as noise removal as well as normalization, silence, elimination are used to enhance the quality of the signal. It has been experimentally demonstrated that the deep learning method can significantly contribute to improving gender prediction accuracy, and the Random Forest classifier is able to differentiate various age groups. The suggested structure is very robust, scalable, and feasible and, therefore, can be implemented in speech-based biometric systems, human-computer interaction, and intelligent voice-assisted systems.

Keywords— Speech processing, gender recognition, age estimation, deep learning, Random Forest.

DIABETES PREDICTION IN HEALTHCARE UTILIZING MACHINE LEARNING ALGORITHMS

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ABSTRACT

Diabetes mellitus is a major global health crisis driven by factors like age, obesity, and heredity. Early prediction is vital to reduce risk factors and severity associated with this chronic condition. This work aims to build a reliable system for forecasting a patient's risk of developing diabetes using Machine Learning (ML) techniques.The system utilizes the diabetes.csv dataset, analyzing crucial features such as Glucose level, Blood Pressure, BMI, Insulin value, and Age. The methodology includes Data Pre-processing, PCA analysis for dimension reduction, and Feature Selection. The data is balanced using SMOTE during the Resampling stage to improve fairness. Model performance is robustly estimated using 10-fold cross-validation.Multiple ML algorithms were assessed. Logistic Regression (LR) provides interpretable findings on risk variables, while Neural Networks (NN) automatically discover the most crucial characteristics from raw data. Both LR and NN provided a respectable performance score following the classification. The system offers a fast, accurate, and user-friendly solution for early detection, supporting proactive health management and serving as a valuable tool for healthcare professionals.

Keywords: Artificial Neural Network (ANN), Machine Learning (ML), Diabetes Prediction, Logistic Regression (LR), Neural Network (NN), 10-fold Cross-Validation, SMOTE, Forecasting, Diabetes Data.

ENHANCING FRAUD DETECTION IN BANKING WITH DEEP LEARNING GRAPH NEURAL NETWORKS AND AUTOENCODERS FOR REAL-TIME CREDIT CARD FRAUD PREVENTION

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ABSTRACT

Artificial Intelligence and deep learning are widely used to analyze large and dynamic banking datasets where fraud detection requires high accuracy and real-time monitoring . Models such as Graph Neural Networks (gnns) and Autoencoders help uncover hidden patterns and detect anomalies in transaction data. This study applies these models using Python to improve fraud detection in large organizations. The goal is to enhance business intelligence and decision-making while strengthening fraud prevention systems. Previous studies demonstrate strong performance of ML and DL techniques in fraud detection. For example, Random Forest models achieved high accuracy in big data analytics applications. ML and DL also support intelligent systems by processing massive datasets efficiently. Advanced research using attention-based gnns improves fraud detection by analyzing complex relationships in data. However, challenges remain, including complex datasets, limited labeled data, and higher inference time. The proposed system integrates model-free and graph-based learning methods to improve detection.These approaches allow learning directly from noisy and high-dimensional data. A GNN with Lambda Architecture enables real-time fraud detection. Autoencoders are used for credit card anomaly detection. Two bank case studies validate the system's performance. The combined architecture improves detection accuracy and supports continuous monitoring. Overall, the system enhances fraud prevention efficiency in banking environments.

Keywords: Artificial Intelligence, Deep Learning, Fraud Detection, Graph Neural Networks, Autoencoders, Lambda Architecture, Credit Card Fraud, Business Intelligence

BONE CANCER DETECTION, STAGING AND AGE ESTIMATION USING K-MEANS AND KNN CLASSIFIERS

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ABSTRACT

Bone cancer is an aggressive disease that is often difficult to diagnose and treat and can be very dangerous for the patient. Bone cancer needs to be predicted in time and accurately for successful treatment and good patient care. This study aims to introduce a bone cancer prediction model that combines regression algorithms and machine learning techniques. The model reads data from patient medical records, such as age, sex, or genetic markers, and trains on it to predict the probability of bone cancer. We have tested linear regression, logistic regression, random forest multiple regression algorithm artificially neural networks, and support vector Machine Learning. We used extensive bone cancer cases and controls dataset from different research centers and hospitals. 6 Our preliminary results show that the new method is more accurate in Nagaraj Parvatha National Student Clearinghouse, USA Raj.parvatha@gmail.com HarinagapraveenGundugolanu USA harinagapraveen2014@gmail.com tree regressors are other known algorithms that could be used to predict bone cancer. Logistic regression is a common algorithm used for binary classification, such as in our bone cancer example above yes no. It applies some mathematical function, a sigmoid, to map a predicated real-valued score into an expected probability between 0–and 1. Then, the algorithm draws a decision boundary to classify these data points based on whether they are bone cancer. Linear regression is a linear algorithm because of the relationship between independent predicting bone cancer than traditional methods. Regrettably, regression algorithms and machine learning techniques are good enough to model many variables at once while detecting intricate patterns in the data, so as a result, the ability to predict is enhanced. Their model can help healthcare professionals identify PD earlier and make well-informed early treatment choices to improve patient outcomes and quality of life. This is a critical goal given the progressive nature of many stage synucleinopathies. However, more studies and validation are needed before implementing the model clinically.

Keywords— Aggressive, Bone Cancer, Regression, Genetic Markers, Healthcare. Keywords: Aggressive, Bone Cancer, Regression, Genetic Markers, Healthcare.

ELECTRICAL AND ELECTRONICS ENGINEERING

A SMART AI-IOT FRAMEWORK FOR SECURE AND RELIABLE ELECTRIC VEHICLES WITH QUANTUM PROTECTIONS

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ABSTRACT

The rapid growth of electric vehicles (EVs) has increased the demand for intelligent monitoring and robust data security mechanisms to ensure operational safety and reliability. This project proposes a Smart AI-IoT Framework for Secure and Reliable Electric Vehicles with Quantum Protection, which continuously monitors critical vehicular parameters such as temperature, vibration, voltage, current, and smoke level using IoT-based sensing infrastructure. Machine learning–based anomaly detection algorithms analyze the real-time sensor data to identify abnormal conditions that may indicate component failure, safety risks, or cyber-physical attacks. The system enables proactive fault detection, improving vehicle reliability and preventing hazardous situations through early alerts. To ensure end-to-end data security, the detected anomalies and sensor records are encrypted using a quantum-inspired encryption approach before being securely stored in an SQLite3 database. The framework is implemented and simulated using the Flask web framework, providing an interactive dashboard for real-time visualization, anomaly reports, and system status monitoring. By integrating AI-driven anomaly detection, IoT sensing, and quantum-level data protection within a lightweight web-based architecture, the proposed system offers a scalable, secure, and intelligent solution for next-generation electric vehicle monitoring and cyber security.

Keywords
Anomaly Detection, Electric Vehicles, Internet of Things, Machine Learning, Quantum Encryption, Secure Monitoring.

A NOVEL ENERGY MANAGEMENT STRATEGY FOR HYBRID VEHICLES

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ABSTRACT

This research offers a Neural Network (NN) driven Energy Management Strategy (EMS) aimed to maximize the battery capacity in Electric Vehicles (EVs). Since batteries are EVs' main energy source, an effective energy management system is essential to guaranteeing ideal power distribution, improving total vehicle performance, and extending battery life. The proposed strategy uses a neural network to dynamically manage power flow b/w battery & other energy sources, like fuel cells, adjusting in real time to changing driving conditions. This approach minimizes power losses, maximizes energy utilization, and maintains an optimal state of charge (SOC) for battery, while preventing excessive wear on the fuel cell. Advantages of this method include better speed regulation, lower battery discharge rates, and improved overall energy efficiency. To evaluate its effectiveness, the ANN-based strategy will be compared with a traditional Fuzzy Logic Controller (FLC). By contrasting performance of ANN and FLC, this study aims to highlight the benefits of the NN's adaptive learning capabilities, especially in responding to dynamic driving conditions and optimizing energy flow more efficiently. By adopting this intelligent management system, EVs can achieve enhanced performance, longer battery life, and greater sustainability, making it a promising solution for future hybrid electric vehicle applications.

Keywords

Energy Management System, Electric Vehicle, Intelligent Control, NN Controller.

ACCURATE IDENTIFICATION OF HARMONIC DISTORTION FOR MICRO-GRIDS USING MACHINE LEARNING-BASED PREDICTIVE MODELS

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ABSTRACT

The increasing use of nonlinear loads such as renewable energy inverters, power electronic converters, and electric vehicle chargers has significantly degraded power quality in modern distribution systems. These loads introduce harmonic distortion, voltage deviation, increased losses, and equipment malfunction, making effective power quality assessment essential. Conventional measurement-based methods are costly and not scalable for large distribution networks.

This work proposes a MATLAB-based simulation framework for harmonic analysis using synthetic data generation. An IEEE-34 bus distribution system is modeled to study realistic feeder behavior, voltage variation, and harmonic propagation. Synthetic voltage and current waveforms are generated by injecting controlled harmonic components, and Fast Fourier Transform (FFT) techniques are applied to compute Total Harmonic Distortion (THDv and THDi) on a bus-wise basis. Artificial Neural Network (ANN) and Multiple Linear Regression models are developed to predict harmonic distortion, where ANN demonstrates superior accuracy under nonlinear operating conditions. A conceptual mitigation model is used to evaluate compliance with IEEE-519 standards.

The proposed approach provides a scalable, cost-effective, and machine-learning-ready solution for power quality assessment and future intelligent monitoring in modern distribution systems.

Keywords :

ANNs, Matlab, harmonic distortion, machine learning, micro-grid.

VOICE CONTROLLED WHEEL CHAIR

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ABSTRACT

The "Voice Controlled Wheelchair for Physically Disabled and Blind People" is designed to provide safe, autonomous, and responsive mobility for individuals with physical or visual impairments. The system integrates an Arduino microcontroller to control the wheelchair's movements and sensors. The wheelchair is equipped with DC motors controlled through a motor driver, mounted on a robust chassis with four wheels for smooth movement. Ultrasonic sensors detect obstacles, while vibration and MEMS sensors monitor collisions or accidents, triggering alerts via a buzzer. The system also integrates GSM and GPS modules to automatically send messages with real-time location information during emergencies. Users can control the wheelchair through voice commands transmitted via a Bluetooth module. The entire system is powered by a 12V battery and an onboard power supply, ensuring continuous and reliable operation. This smart wheelchair aims to enhance independence, safety, and convenience for disabled and blind users.

Keywords

AI-powered home security, Internet of Things (IoT), Smart home automation, Real-time monitoring, Energy-efficient systems.

AUTOMATIC DYNAMIC WIRELESS EV CHARGING SYSTEM

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ABSTRACT

This paper proposes dynamic wireless charging system of electric vehicles using inductive power transfer which is designed as a hybrid renewable energy based system. The suggested system combines wind power and solar photovoltaic to power the contactless EV charging under changing conditions. High frequency wireless power transfer converter facilitates transfer of energy between high-frequency coil embedded on the road and the primary coil on the vehicle. The charge is applied in the battery with monitoring of the state of charge through the received power. The entire system is simulated and modeled in MATLAB / Simulink and the performance of the system is studied in terms of voltage current, power response and battery SOC. The findings of the simulations indicate that the wireless power transfer, the continuous SOC enhancement, and the decreased reliance on the traditional grid power are stable, and the suggested system can be used in the sustainable electric vehicle charging practices.

Keywords

Wireless Charging, Inductive Power transfer, Electric Vehicle, Hybrid renewable Energy, Wind energy, Solar PV, Battery SOC.

LOCATION-BASED GUIDED ROBOT WITH VOICE FEEDBACK AND GPS NAVIGATION

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ABSTRACT

Autonomous mobile robots have a role in the contemporary automation systems especially in the navigation-based and assistive applications. In this paper, the design and implementation of a Location-Based Guided Robot with Voice Feedback and GPS Navigation has been provided. The suggested system will then autonomously steer through the pre-defined destinations with programmed distance values and avoid obstacles with the help of ultrasonic sensing. The coordination of motor control, sensor processing, GPS localization and voice output are coordinated by an Arduino Uno and ESP32 microcontroller. An L293D motor driver allows the user to control motor direction and a DC motor-driven chassis allows the chassis to move. Real time location information is provided by a GPS module and audio feedback is provided to the human-robot interface by a voice module. A LCD is I2C based and it is also used to show system status. The use of the system is appropriate in guided delivery system, assistive robotics, and education since experimental outcomes prove dependable navigation, efficient obstacles recognition and straightforward voice feedback.

Keywords
Autonomous robot, GPS navigation, voice feedback, Arduino Uno, ESP32,ultrasonic sensor.

AI-POWERED PNEUMONIA DETECTION AND AUTOMATED ALERT SYSTEM USING MULTI-MODEL ENSEMBLE DEEP LEARNING

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ABSTRACT

Pneumonia is a life-threatening respiratory infection that must be effectively and swiftly diagnosed to limit the number of fatal cases particularly in healthcare settings that are resource limited. Despite successful performance of deep learning techniques in the medical image analysis, in real clinical conditions, single-model approaches present limited generalization and unreliable predictions. The paper introduces a multi-model ensemble deep learning framework-based pneumonia tracking and automated warning system, which is AI-powered. The suggested system will compare the X-ray images of the chest with five complementary models such as Gray CNN, MobileNetV2, EfficientNetB0, DenseNet121, and ResNet50, to enhance the diagnostic robustness and reliability. Stacking-based ensemble strategy that uses logistic regression calibration is carried out to integrate single model outputs and comes up with confidence-sensitive predictions. The threshold of decisions is optimized to focus on high confidence predictions and reduce false alarms. The system is implemented as the real-time web application where the automated system of email notification is incorporated which provides the medical authorities with the professional diagnostic reports. The accuracy of the proposed method in terms of high-confidence capability (94.6) is proven through experimental assessment and suggests that the proposed method is effective and can be used in clinical practice.

Keywords
Pneumonia Detection, Ensemble Deep Learning, Chest X-Ray Analysis, Medical Image Classification, Clinical Decision Support System, Automated Medical Alert System.

ANFIS-BASED SOFT-SWITCHINGV2VENERGY TRANSFER TOPOLOGY FOR ENHANCED EFFICIENCY IN ELECTRIC VEHICLES

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ABSTRACT

The electrification of vehicles is one of the most promising approaches to reducing emissions from the transportation sector. However, range anxietyremains a major barrier to the widespread adoption of electric vehicles (EVs). In emergency situations, vehicle-to-vehicle (V2V) energy transfer can effectively mitigate range anxiety by providing supplemental energy and addressing the “last-mile” challenge. Traditional V2V energy-sharing methods based on motor inverters and motor windings, however, typically over look efficiency optimization during power transfer.

To improve overall system performance, this paper proposes a new V2V power-transfer topology that incorporates a soft-switching strategy operating at a reduced switching frequency. The lower switching frequency significantly minimizes core losses in the motor—whose windings and silicon-steel core function as an inductive component during V2V energy exchange.

Furthermore an Adaptive Neuro-Fuzzy Inference System (ANFIS) controlleris integrated into the proposed topology to achieve intelligent, real-time optimization of switching parameters. By learning online system characteristics and adapting to varying load and operating conditions, the ANFIS controller enhances soft-switching performance, reduces switching losses, and improves overall energy-transfer efficiency.

Keywords

Vehicle-to-Vehicle Energy Transfer, ANFIS Control, Soft Switching, Electric Vehicles, Power Transfer Efficiency

A TWO-STAGE AC–DC CONVERTER WITH ANFIS CONTROL FOR SIMULTANEOUS DUAL-BATTERY CHARGING IN ELECTRIC VEHICLE

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ABSTRACT

This paper presents a two-stage AC–DC power conversion architecture for electric vehicle (EV) applications capable of simultaneously charging two batteries. The proposed topology consists of a three-phase multilevel boost power factor correction (PFC) converter followed by an isolated bidirectional dual-output DC–DC converter with zero-voltage switching (ZVS) capability. The two stages operate independently, enabling the AC–DC stage to function in continuous conduction mode (CCM) without being affected by duty-cycle variations in the DC–DC stage. To enhance system performance, an Adaptive Neuro-Fuzzy Inference System (ANFIS)–based control strategy is employed for regulating the DC-link voltage and ensuring equal power sharing between the two battery outputs. The ANFIS controller effectively improves dynamic response, reduces total harmonic distortion (THD), and achieves near-unity power factor under varying load and battery conditions. A comprehensive operating principle and control analysis of the proposed dual-battery charger is presented. The feasibility and effectiveness of the proposed system are validated through extensive Matlab/simulink results obtained.

Keywords
Electric Vehicle, Dual battery charging, Multilevel PFC, ANFIS controller, ZVS DC–DC converter.

A HIERARCHICAL OPTIMIZATION-BASED OMPC ALGORITHM FOR POWER SHARING IN MULTI-MODULE FAST EV CHARGING SYSTEMS

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ABSTRACT

This paper introduces a novel Optimal Modular Power Coordination (OMPC) algorithm for multi module, multiport Fast Electric Vehicle Chargers (FEVCs). The proposed algorithm addresses the critical challenge of coordinated power distribution at both the module and charger levels through a hierarchical optimization framework. At the upper layer, a mixed-integer optimization model determines the optimal number of active power electronic modules (PEMs), selects the most efficient modules for contribution, and governs inter-port PEM borrowing decisions. At the lower layer, a real-time convex optimization routine computes optimal power-sharing ratios among the selected PEMs while satisfying grid limitations, module constraints, and thermal operating conditions. A key contribution is the introduction of PEM borrowing, a new concept that enables flexible reallocation of module power across different charging ports, significantly enhancing the charging power range and enabling dynamic split dual-port operation. Comprehensive simulation and experimental case studies validate the proposed OMPC algorithm, demonstrating substantial improvements in charging flexibility, module utilization balance, and charging speed reliability. Results confirm that the OMPC approach effectively mitigates charging bottlenecks and enhances the overall performance of multi module FEVC systems.

Keywords

Inter-port PEM Borrowing Decisions, Convex Optimization, Charging Bottlenecks.

INTELLIGENT PV-BESS INTEGRATED EV CHARGING STATION USINGANFIS MPPT AND NOVEL BATTERY CONTROLLER

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ABSTRACT

This work presents a grid-connected electric vehicle (EV) charging station integrating a photovoltaic (PV) array and battery energy storage system (BESS) with enhanced power management and grid support. An adaptive Neuro-fuzzy inference system (ANFIS) is employed for maximum power point tracking (MPPT) of the PV array, ensuring optimal energy extraction under varying solar irradiance and temperature conditions. A novel BESS controller is proposed to regulate charge/discharge cycles efficiently while maintaining grid stability and minimizing power fluctuations. The EV and BESS are interfaced through a bidirectional DC-DC converter at the DC link, enabling seamless energy flow between the PV array, storage, EV, and grid. During daytime, EVs are primarily charged from the PV array, while the grid supplements energy in the absence of solar power. The system ensures synchronization at the point of common coupling (PCC) with the grid, enhancing power quality and reliability. The proposed approach is validated through a hardware-in-the-loop prototype, demonstrating robust performance under dynamic operating conditions and effective utilization of renewable energy.

Keywords
Adaptive Neuro-fuzzy inference system (ANFIS), battery energy storage system (BESS), electric vehicle (EV) charging station, maximum power point tracking (MPPT), photovoltaic (PV), power quality.

THE PROTOTYPE SPECIFICATIONS FOR GENERATING POWER USING A SPEED BREAKER WITH IOT MONITORING

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ABSTRACT

This Paper presents an integrated solution for generating electricity from kinetic energy and monitoring the output using an Internet of Things (IoT) framework. The core mechanism involves embedding Piezoelectric Transducers (PZTs) within a speed breaker to convert the mechanical pressure applied by a vehicle's weight into electrical energy.

The system is designed to capture the low-voltage, high-frequency AC output from the PZTs and condition it into stable DC power. For system validation and remote access, an IoT infrastructure is employed. An ESP Microcontroller (ESP8266/ESP32) is responsible for measuring the output voltage in real-time and transmitting this data via Wi-Fi. The data is securely hosted on the Firebase Realtime Database. A user-friendly mobile application, developed using MIT App Inventor, provides a real-time dashboard, allowing users to remotely monitor the voltage generated and assess the system's efficiency.

The prototype successfully demonstrates the feasibility of combining kinetic energy harvesting from traffic with modern cloud-based monitoring, offering a scalable, pollution-free solution for localized power generation and smart infrastructure management.

Keywords

Piezoelectric Transducer (PZT), Energy Harvesting, Speed Breaker, Internet of Things (IoT), ESP8266/ESP32, Firebase,MIT App Inventor.

IMPLEMENTATION OF AN OPTIMIZED PI CONTROLLER FOR DESIGN AND PERFORMANCE ANALYSIS OF AN ON-GRID SOLAR SYSTEM FOR A RESIDENTIAL HOUSE

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ABSTRACT

This paper presents the implementation of an optimized Proportional-Integral (PI) controller for an on-grid solar system designed for residential applications. The proposed system integrates a solar photo voltaic(PV) array with the grid, ensuring efficient power transfer while maintaining stability under varying solar irradiance and load conditions. The optimized PI controller is tuned to enhance dynamic response, minimize steady-state errors, and improve voltage regulation compared to conventional PI controllers. Performance analysis includes Total Harmonic Distortion (THD), grid voltage stability, and power quality assessment. Simulation results demonstrate a significant reduction in harmonics, improved transient response, and enhanced overall system efficiency. The optimized controller enables better synchronization between the solar PV system and the grid, ensuring reliable and uninterrupted power supply. This study highlights the effectiveness of advanced control strategies in enhancing the performance of residential on-grid solar systems, making them more robust and adaptable to real-world operating conditions. The findings contribute to optimizing renewable energy integration for sustainable urban power solutions.

Keywords
On-grid Solar system, PV, Optimized PI Controller.

ENHANCED HYBRID ENERGY STORAGE MANAGEMENT USING MPC WITH REAL-TIME BATTERY AGING CONSIDERATION

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ABSTRACT

This article introduces an improved energy management strategy for a hybrid energy storage system (HESS) combining a battery and ultra capacitor (UC) in electric vehicles. The strategy uses Model Predictive Control (MPC) to optimally share power between the battery and UC based on predicted driving demand. The UC handles high-frequency power fluctuations, while the battery supplies the main energy, improving efficiency and performance.

A major enhancement is the integration of a real-time battery-aging model into the MPC framework. Instead of using a constant C-rate, the controller calculates a time-varying C-rate at every moment to better estimate battery degradation. This enables smart decision- making that reduces battery stress during high load events.

Simulation and experimental results show that this aging-aware approach increases UC utilization, reduces battery capacity fade, and enhances overall system durability. Thus, the proposed MPC-based energy management strategy significantly improves the lifespan and efficiency of HESS in electric vehicles.

Keywords

HESS, MPC, Battery aging, Ultra capacitor, Electric vehicles.

OPTIMIZATION WORKFLOW OF HYBRID RENEWABLE ENERGY SYSTEM USING HYBRID GBDT CONTROLLER

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ABSTRACT

Hybrid renewable energy systems (HRES), particularly those integrating solar and wind sources, have emerged as promising solutions to the global energy crisis. However, the nonlinear and time-varying characteristics of these resources pose significant challenges to consistently harvesting maximum power. Maximum Power Point Tracking (MPPT) is essential to ensure optimal performance under varying environmental conditions, yet traditional MPPT controllers often suffer from slow dynamic response and fixed step-size limitations. To address these issues, this work introduces an enhanced optimization-driven control strategy that integrates a Gradient Boosting Decision Tree (GBDT) model with an advanced met heuristic optimization algorithm. The proposed hybrid framework determines the optimal duty cycle of the boost converter in a solar–wind energy system, enabling rapid and accurate convergence to the maximum power point. The method is implemented and evaluated in MATLAB/Simulink, and the results demonstrate significant improvements in tracking speed, stability, and overall power extraction efficiency compared to conventional MPPT techniques.

Keywords

Maximum power point tracking, hybrid solar–wind system, machine learning, GBDT, walrus optimization algorithm.

DRIVE TRAIN-INTEGRATED COMBINATORY AC–DC CHARGING OF ELECTRIC VEHICLESUSING AN ANFIS-BASED DC-LINK CONTROLLER

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ABSTRACT

Reducing the battery charging time of electric vehicles (EVs) is one of the key factors in accelerating their widespread adoption. Commercial off-board high-power DC fast-charging stations require high initial investment and maintenance costs, whereas standard on-board Type-1 and Type-2 AC chargers rated between 3.3 kW and 19 kW result in long charging durations. This paper proposes a combinatory AC–DC charging approach to increase the charging rate of EV batteries. The proposed approach enables simultaneous charging of the EV battery using an on-board Type-2 AC charger and a drive train-integrated DC charger.

For drive train-integrated DC charging, a DC input port (N(+), O(−)) is formed using the neutral point of the EV motor windings (N) and the negative rail of the drive train inverter (O). Through this DC input port, power can be accepted from renewable energy–based DC micro grids, solar rooftops, and other EV batteries. The EV drive train inverter is controlled as an integrated interleaved DC–DC converter (IDC), with the motor windings reutilized as filter inductors. To ensure adaptive and robust operation under simultaneous AC and DC charging conditions, an ANFIS-based DC-link voltage controller is proposed to replace the conventional PI controller. The proposed controller effectively handles system nonlinearities and variations in source and load conditions while regulating the common DC-link voltage.

The performance of the EV motor and drive train-integrated DC charger with the proposed ANFIS-based control scheme is validated through finite element method (FEM) co-simulation using ANSYS Maxwell and Simplorer. Furthermore, a scaled experimental prototype is developed to verify the feasibility and effectiveness of the proposed combined AC–DC charging approach.

Keywords

Combinatory ac and dc charging, EV battery charging, dc input port and drive train integrated dc charging.

SLIDING MODE CONTROLLED THREE-PORT BOOST CONVERTER WITH PARTIAL POWER PROCESSING FOR ON-BOARD ELECTRIC VEHICLE CHARGERS

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ABSTRACT

The objective of this work is to design and develop a new three port boost AC-DC converter which facilitates on-board fast charging for electric vehicles using partial power processing (PPP) at bidirectional DC-DC stage. As compared to conventional two-stage chargers with two port AC- DC and full-power processing (FPP) DC-DC converter, the three-port converter (TPC) ensures reduced voltage stress across the switches. This allows the converter operation at higher power without additional stress on devices while reducing the charging time. The PPP at DC-DC stage makes it highly efficient due to reduced power conversion stages. The proposed TPC can generate three levels of output voltage, which reduces the converter switching loss. The proposed TPC with PPC concept further minimizes the power losses as only a fraction of the power is processed by the DC-DC converter switches and components. Hence, the charger overall size and cost can be reduced while achieving significantly high efficiency as compared to conventional two-stage charger with FPP, even without soft switching. The performance of proposed charger is validated under different operating conditions using MATLAB/Simulink based simulation model for 6.6 kW and scaled down-lab prototype for 1.5 kW.

Keywords

Three-Port Converter (TPC), Partial Power Processing (PPP), Boost AC-DC Converter, Bidirectional DC-DC Stage, On-board Fast Charger

MITIGATING PCC HARMONIC DISTORTION IN SOLAR-GRID EV CHARGING SYSTEMS WITH CLOSED-LOOP CONTROL

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ABSTRACT

The increasing integration of electric vehicles (EVs) into power systems presents significant challenges related to harmonic distortion and power quality at the Point of Common Coupling (PCC). This paper proposes a hybrid solar-grid EV charging system with a closedloop PI-controlled Buck Converter to regulate the charging process and mitigate harmonic injection. By dynamically adjusting the charging parameters, the proposed system minimizes voltage and current distortions, ensuring efficient power distribution between the solar PV, grid, and EV charger. Simulation results demonstrate that the closed-loop control effectively reduces Total Harmonic Distortion (THD), stabilizes power flow, and enhances overall grid performance. Compared to traditional open-loop EV charging methods, the proposed strategy significantly improves PCC power quality, making it a viable solution for sustainable and efficient EV charging infrastructure.

Keywords
Electric vehicle charging, harmonics, power quality, power system, PI Controller

IOT-ENABLED SMART PROTECTION SYSTEM FOR THREE-PHASE NETWORKS WITH REAL-TIME CLOUD MONITORING

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ABSTRACT

The original microcontroller-based system provided robust, localized over-voltage and over PIC18F2550 and a Visual Basic current protection for three-phase electrical networks using a GUI for control. This enhanced project retains the core safety mechanism—fast, transistor driven relay activation for fault isolation —but integrates a powerful IoT layer for remote monitoring and control. By replacing or augmenting the PIC microcontroller with a Wi-Fi capable module (e.g., ESP32), the system pushes real-time voltage and current measurements to the Firebase Real time Database. A custom-built mobile application, developed using MIT App Inventor, allows users to monitor the status, view sensor data, and receive instant push notifications when a fault (over-voltage or over-current) is detected. This upgrade enhances system reliability and user interaction by providing access to the critical data remotely, moving beyond the limitation of the local Windows-based GUI.

Keywords

IoT, Three-phase protection, ESP32, Cloud monitoring, Firebase, Over-voltage, Over-current.

ELECTRONICS AND COMMUNICATION ENGINEERING

HIGH-PERFORMANCE FLOATING-POINT MULTIPLIER USING RADIX-16 BIT-PAIR RECODING FOR NEURAL NETWORK APPLICATIONS

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ABSTRACT

This work proposes a high-performance floating-point multiplier for neural network applications based on the Radix-16 Unsigned Bit-Pair Recoding algorithm. The proposed system reduces the number of partial products generated during multiplication, enabling faster computation and lower latency compared to conventional multipliers. By integrating the Radix-16 BPR approach with a pipelined architecture, the design achieves high throughput while maintaining accurate single- and double-precision floating-point operations. The system is optimized for hardware efficiency, minimizing area and power consumption, making it suitable for deployment in neural network accelerators and edge AI devices. Simulation and synthesis results are expected to demonstrate significant improvements in speed, energy efficiency, and scalability. The proposed multiplier architecture provides a practical solution for accelerating large-scale neural network computations and enabling real-time performance in AI applications.

Keywords

Radix-16 Bit-Pair Recoding, Floating-Point Multiplier, Neural Network Acceleration, High-Speed Arithmetic, Low-Power Design, Deep Learning Hardware.

DESIGN AND IMPLEMENTATION OF A HIGH-PERFORMANCE LOOK-UP TABLE (LUT) ACCELERATOR USING CAM-RAM ARCHITECTURE IN VERILOG HDL

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ABSTRACT

This project presents the design and implementation of a hardware accelerator based on Content Addressable Memory (CAM) and Random Access Memory (RAM) for high-speed function approximation and data transformation. Traditional Arithmetic Logic Units (ALUs) often struggle with non-linear functions (such as sin(x), log(x), or complex scaling) due to the high clock-cycle latency of iterative algorithms. This design addresses these bottlenecks by utilizing a parallel search-and-retrieve architecture.

The core of the accelerator is a Binary CAM implemented in Verilog HDL, which acts as a "hardware search engine." It takes a search key as input and identifies its location in a single clock cycle. This location is then used as an address for a synchronized Result RAM, which outputs the pre-computed value. The design is optimized for Xilinx FPGA architectures by utilizing distributed RAM and Look-Up Table (LUT) primitives to minimize resource consumption and maximize frequency.

Keywords

Content Addressable Memory, LUT Accelerator, CAM-RAM Architecture, FPGA, Verilog HDL, Function Approximation, Hardware Acceleration.

DESIGN AND ANALYSIS OF LOW-POWER WIDE-RANGE VOLTAGE LEVEL SHIFTERS IN DIGITAL CMOS VLSI

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ABSTRACT

This project presents the design and analysis of a low-power wide-range CMOS voltage level shifter (LPWR-VLS) optimized for digital VLSI applications. The proposed architecture supports broad voltage translation, minimizes leakage currents, and maintains robust operation across process, voltage, and temperature variations. Key design strategies include stacked transistor configurations, cross-coupled inverter topologies, and adaptive threshold voltage control to optimize speed and power. Voltage level shifters are critical components in multi-voltage CMOS VLSI systems, enabling reliable communication between blocks operating at different supply voltages. However, achieving both low-power operation and wide input/output voltage compatibility remains challenging, especially in deep-submicron technologies. Simulation results demonstrate that the LPWR-VLS achieves low static power consumption, fast propagation delay, and full voltage swing across a wide range of input voltages, making it suitable for energy-efficient multi-voltage digital systems.

Keywords

Voltage Level Shifter (VLS), Low-Power CMOS Design, Wide-Range Voltage Translation, Leakage Reduction, Cross-Coupled Inverter, Multi-Voltage Digital Systems, Deep-Submicron CMOS, Propagation Delay Optimization, Process-Voltage-Temperature (PVT) Variation, Energy-Efficient VLSI.

DESIGN OF TERNARY LOGIC BY USING 45NM TECHNOLOGY

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ABSTRACT

Ternary logic offers the potential to enhance computational density and reduce interconnect complexity compared to conventional binary systems. In this work, we present a circuit-level implementation of ternary logic using a hybrid approach that combines depletion-mode (D-mode) and conventional MOSFETs. The proposed design enables reliable realization of three-valued logic states while maintaining compatibility with standard CMOS fabrication processes. By leveraging the unique characteristics of D-mode MOSFETs, the circuits achieve low power consumption, reduced transistor count, and compact layout compared to traditional ternary designs. Simulation results demonstrate correct ternary operation across a range of supply voltages and temperatures, highlighting robustness and scalability. The approach facilitates efficient ternary-to-binary interfacing, making it suitable for integration into mixed-signal and digital systems aimed at high-density computing. This work provides a practical pathway toward energy-efficient, high- performance ternary logic circuits for next-generation computing architectures.

DETECTION AND CLASSIFICATION OF BRAIN TUMOR USING HYBRID MACHINE LEARNING MODELS

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ABSTRACT

Brain tumors are among the most serious medical conditions and have a strong impact on the neurological functions of a patient as well as on their overall health. Early detection and accurate identification are crucial to successful treatment and better survival rates. Conventional diagnostic techniques like MRI scans reported by radiologists are subjective, time- consuming, and susceptible to human error. To overcome these issues, this paper introduces a hybrid machine learning model that combines VGG16 for feature extraction, Random Forest (RF) for feature selection, and XGBoost (XGB) for final clas- sification. VGG16 extracts deep spatial and structural features from MRI scans, RF selects the most useful features to improve model performance, and XGB classifies the images into four classes: glioma, meningioma, pituitary tumor, and no tumor. We tested two hybrid models: RF + Logistic Regression and RF + XGBoost, with RF + XGBoost having the highest accuracy of 98 percentage beating RF + Logistic Regression. This approach increases classification accuracy, decreases false positives, and makes the computation more efficient. The suggested hybrid model is an automatic, stable, and highly accurate brain tumor detection system that can help medical practitioners make faster and more trustworthy diagnoses.

FSM-BASED ADAPTIVE TRAFFIC SIGNAL CONTROLLER USING VLSI

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ABSTRACT

Traffic congestion at road intersections is a major problem due to the use of fixed-time traffic signal systems, which do not adapt to real-time traffic conditions. To overcome this limitation, this project presents a Density Based Adaptive Traffic Light Controller using VLSI that dynamically adjusts signal timing based on traffic density. The proposed system uses traffic sensors at each road to detect the presence of vehicles. These sensor outputs are treated as digital inputs and are processed using a density counter module to estimate traffic load on each road. Based on the calculated density, a variable timer generator determines the green signal duration, allowing roads with higher traffic density to receive longer green time, while roads with lower density receive shorter green time. The core control mechanism is implemented using a Finite State Machine (FSM), where each state corresponds to a specific road receiving the green signal. The FSM automatically transitions between states based on timer expiration and traffic density information. This adaptive approach eliminates unnecessary waiting time, improves traffic flow efficiency, and reduces congestion. The entire system is designed and simulated using VLSI design methodology, making it suitable for FPGA or ASIC implementation. This project demonstrates an efficient, scalable, and smart traffic control solution, highlighting the application of VLSI concepts such as FSM design, digital counters, and timing control in real-time systems.

Keywords
VLSI technology, ASIC and FPGA-based designs.

ENERGY EFFICIENT LOW LATENCY SIGNED MULTIPLIER FOR FPGA BASED ACCLECTORS DESIGN OF HIGH SPEED SIGNED MULTIPLIER FOR DSP APPLICATIONS

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ABSTRACT

In this project, a novel architecture for Booth multiplier is implemented. By using 6-input LUTs and associated fast carry chains of modern FPGAs, we present an architecture for signed multipliers that provides better performance than state-of-the-art designs. The proposed partial product encoding technique reduces the length of the carry chain in each partial product to further reduce the critical path of the multiplier. FPGA-based designs that exist are largely limited to unsigned numbers, which require extra circuits to support signed operations. To overcome these limitations for the FPGA-based implementations of applications utilizing signed numbers, this project presents an area-optimized, low-latency and energy-efficient architecture for accurate signed multiplier. This design is simulated and synthesized using Xilinx ISE 14.7.

Keywords
Energy-Efficient applications, Signed multipliers, FPGA-based designs

AI-DRIVEN MONITORING AND PREDICTIVE ANALYSIS OF INDIAN FOREST ECOSYSTEMS

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ABSTRACT

Forests are essential in stabilizing the eco-system, population of the earth, and fighting climate change. In India, due to the rapid deforestation, degradation of habitats and unsustainable land use, thus forest ecosystems have been in danger and this has given way to new methods of monitoring and managing forests. This study introduces a Forest Monitoring AI based Indian Forest Monitoring App that will add real-time surveillance, forecasting, and geospatial mapping to Indian forests. The application combines a variety of disparate data sources, such as satellite images, government forest surveys and climate records as well as wildlife census data, to produce actionable information to be used in conservation planning. Predictive modules are based on advanced machine learning: a Random Forest Regressor model assesses the suitability of a forestation based on the soil fertility, rainfall, temperature, elevation, slope, vegetation cover, population density, and the distance to water sources; time-series forecasting is used to predict deforestation risks, using historical trends and patterns and lags; and climate impact analysis uses linear regression, time-series decomposition and correlation analysis to gauge environmental influences to forest health. This application has a dynamic dashboard constructed using Streamlit and complemented by Plotly and Folium to create the ability to join multidimensional data and render dashboards that are adaptive in view of data and geospatial visualization. Locally-specific models are trained on four regions (the Western Ghats, Eastern Ghats, Central India and Northeast India) to provide accurate, regional predictions.

Keywords—
Indian forests, forest monitoring, deforestation prediction, afforestation suitability, wildlife population modeling, climate impact analysis, machine learning, geospatial visualization.

INNOVATIVE RISC-V PROCESSOR IMPLEMENTATION WITH NAND GATE STANDARD LIBRARIES FOR LOW-POWER COMPUTING

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ABSTRACT

This project presents an innovative design of a RISC-V processor architecture utilizing a specialized library of NAND gate standard cells. The primary objective is to achieve a compact, energy-efficient, and high-performance computing system by optimizing the fundamental logic gates within the processor core. By focusing on a NAND-based standard library approach, the design enables streamlined logic synthesis, reduced leakage power, and improved area efficiency across the silicon floor plan.

The processor architecture is meticulously optimized to leverage the logic density of NAND-based cells, ensuring high-speed switching and minimized power-delay products while maintaining structural integrity. Detailed simulations and performance analyses demonstrate significant reductions in dynamic power consumption compared to generalized CMOS designs, without compromising the computational throughput required for modern applications. This proposed approach provides a scalable and robust solution for next-generation embedded systems. The entire architecture is designed and verified in the Xilinx Vivado software environment using Verilog HDL.

Keywords

RISC-V processor, NAND gate standard library, Low-power computing, Verilog HDL, Xilinx Vivado, Energy-efficient architecture, Microprocessor design.

OPERATIONAL CURRENT AMPLIFIERS -BASED QURADRATURE OSCILLATORS FAMILY

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ABSTRACT

This design explores a family of Quadrature Oscillators based on Operational Current Amplifiers (OCAs), implemented using Tanner EDA in 45nm CMOS technology. Quadrature oscillators are essential in modern communication systems (such as QAM and QPSK modulators) for generating two sinusoidal signals with a 90^{\circ} phase difference. The proposed circuits utilize the OCA as the primary active building block, which provides high output impedance and versatile current-transfer characteristics. By employing a systematic synthesis method, multiple topologies are realized using a minimal number of grounded capacitors and resistors—ideal for integrated circuit implementation. The transition to the 45nm node poses challenges in terms of short-channel effects and leakage; however, the current-mode nature of the OCA maintains high linearity and frequency stability even at reduced supply voltages (V_{DD} \approx1.1V). Simulation results in Tanner EDA (T-Spice) verify the Condition of Oscillation (CO) and Frequency of Oscillation (FO). The design achieves a wide tuning range, low. Total Harmonic Distortion (THD), and consistent quadrature phase relationship across various process corners. Submitted by:

AI – BASED LEARNING ASSISTANT

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ABSTRACT

The AI-based Learning Assistant is a smart educational application designed to help students learn lessons in a more comfortable and effective way. The main idea of this system is to convert lesson content into clear and accurate audio so that students can listen and understand their subjects easily. This is especially helpful for learners who prefer listening rather than reading.

A special feature of this learning assistant is that it works according to the emotional condition of the student. The application supports different human emotion modes such as angry, soft, good, peaceful, faithful, happy, and love. Based on the selected or detected mode, the assistant changes its voice tone, speed, and style of explanation. For example, when a student feels stressed or angry, the system uses a calm and soft voice, while a happy mode delivers lessons in an energetic and motivating way. By adjusting lesson delivery according to human emotions, the AI-based Learning Assistant creates a friendly and supportive learning environment. This helps students stay focused, feel understood, and improve their overall learning experience. The system aims to make education more personalized, engaging, and emotionally aware using artificial intelligence.

The main motive of this project is to improve the learning experience of students by providing an intelligent and emotionally adaptive learning assistant. Many students face difficulties in understanding lessons due to stress, lack of interest, or different emotional conditions. This project aims to solve that problem by delivering lessons in a voice and tone that matches the student's emotional state. By combining artificial intelligence with emotionbased interaction, the system helps students learn comfortably, stay motivated, and understand concepts better. The ultimate goal of this project is to make learning more personalized, supportive, and effective for every student.

REVOLUTIONIZING VLSI PHYSICAL DESIGN WITH AI-A NEW ERA OF POWER, PERFORMANCE, AND AREA OF OPTIMIZATION

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ABSTRACT

The rapid evolution of semiconductor technology has intensified the demand for efficient Very-Large-Scale Integration (VLSI) physical design methodologies that optimize power, performance, and area (PPA). Traditional design flows, while robust, often struggle to meet the increasingly complex constraints of modern circuits. This project explores the transformative potential of Artificial Intelligence (Al) in revolutionizing VLSI physical design, introducing intelligent algorithms that adaptively learn and optimize layout strategies. By integrating machine learning, reinforcement learning, and heuristic-driven models into key stages such as floor planning, placement, and routing, Al enables dynamic decision-making that surpasses conventional rule. Based approaches. The project investigates how Al techniques can reduce power consumption, enhance timing closure, and minimize silicon area-ultimately accelerating design cycles and improving manufacturability.

DESIGN AND IMPLEMENTATION OF RSA CRYPTOGRAPHY USING AN INEXACT MULTIPLIER

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ABSTRACT

RSA (Rivest-Shamir-Adleman) cryptography is a widely adopted public-key encryption method, valued for its security and reliance on intricate mathematical procedures like modularexponentiation. Nevertheless, these computations, especially large integer multiplications, require substantial processing power and hardware resources. This makes conventional RSAimplementations less suitable for resource-limited and low-power environments, such as Internetof Things (IoT) devices, embedded systems, and real-time multimedia encryption. To overcomethese challenges, this project introduces an enhanced RSA hardware architecture that incorporates an 8-bit Dadda multiplier combined with a 5:2 compressor, forming an approximate computing unit designed to optimize both performance and energy consumption. The 5:2 compressor minimizes the number of addition steps during partial product summation, while the Dadda multiplier enables rapid multiplication. This approximate multiplier design notably decreases power usage, chip area, and processing delay, making it ideal for energy-sensitive hardware scenarios.

The proposed solution achieves nearly a 27% reduction in power consumption while preservingencryption accuracy. Although slight decryption errors arise due to approximation, their effect isminimal for applications where perfect precision is not essential. Simulation outcomes show thatencryption remains unaffected, and hardware synthesis on an FPGA platform reveals enhancements in timing, area, and logical complexity. This work highlights the potential ofapproximate computing in cryptographic systems, providing a promising approach for futuresecure communication technologies that demand a balance between speed, energy efficiency, and security. Traditional RSA systems, especially those utilizing exact multipliers like carry-save or array-based designs, consume significant amounts of power due to their complex logic structures. In contrast, the approximate computing approach sacrifices a minimal amount of accuracy in favour of Dadda-based multipliers, offers several distinct advantages over traditional RSA hardware implementations.

Keywords
Cryptography, Dadda multiplier, 5:2 Compressor, Speed, Power consumption

THE A-FRAME SUITE

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ABSTRACT

Problem & Motivation: Traditional classroom management relies on manual attendance and subjective engagement checks, leading to inefficiency and a lack of actionable data for educators.

Proposed Solution: To address this, we propose "The A- Frame Suite" an AI-based Attendance and Focus Tracker that automates and objectifies classroom monitoring using computer vision.

Core Implementation & Features: The system utilizes facial recognition for contactless, automatic attendance logging. Furthermore, it employs machine learning models to analyze student facial expressions and body posture in real-time to gauge attentiveness. This data is processed and centralized through an intuitive faculty dashboard.

Results & Outcomes: The dashboard provides visual analytics, including attendance records, engagement heatmaps, and distraction alerts, enabling instructors to identify focus gaps and correlate behavior with academic performance.

Conclusion & Implication: Overall, "The A- Frame Suite" offers a smart, data-driven solution to enhance classroom efficiency, foster student engagement, and support informed pedagogical intervention.

DESIGN AND VERILOG SIMULATION OF AN EFFICIENT SRAM MEMORY CONTROLLER FOR VLSI EMBEDDED SYSTEM

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ABSTRACT

Static Random Access Memory (SRAM) is widely used in high-speed digital systems because of its low access time and high reliability. An SRAM controller plays a vital role in managing the read and write operations between the processor and memory. This project focuses on the design and implementation of an SRAM controller using VLSI design techniques. The controller is designed using hardware description language (HDL) to generate control signals, manage memory addressing, and ensure proper timing for read and write operations. Optimization techniques are applied to reduce power consumption, improve speed, and minimize chip area. The designed SRAM controller is simulated and verified using EDA tools to validate its functionality. The results show that the proposed design provides efficient and reliable memory access, making it suitable for embedded systems and high-performance computing applications.

INTELLIGENT ELEVATOR CONTROLLER USING FSM (VERILOG IMPLEMENTATION)

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ABSTRACT

This project presents the design and Verilog implementation of an intelligent elevator controller based on a Finite State Machine (FSM) architecture. The system is designed to efficiently manage elevator movements in a multi-floor building while ensuring safety, reduced waiting time, and optimized energy usage. The controller handles requests from both inside the elevator cabin and external floor call buttons, prioritizing requests based on direction and current elevator position. The proposed FSM model consists of clearly defined states such as Idle, Moving Up, Moving Down, Door Opening, Door Open, and Door Closing. Transitions between these states are determined by input signals including floor requests, door sensors, overload detection, and emergency signals. This structured FSM approach improves reliability, simplifies debugging, and ensures predictable behavior under all operating conditions. The Verilog Hardware Description Language (HDL) is used to implement the controller, making the design suitable for FPGA or ASIC-based embedded systems. The design includes modules for request storage, direction control, motor control signals, and door operation timing. Simulation results verify correct elevator behavior such as proper floor servicing order, safe door operations, and correct response to emergency conditions. This intelligent elevator controller demonstrates how digital design techniques and FSM modeling can be applied to real-world automation systems. The project provides a scalable and modular framework that can be extended to support additional features such as priority floors, smart scheduling algorithms, and IoT-based monitoring in modern smart buildings.

IoT ENABLED SMART HOME AUTOMATION SYSTEM

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ABSTRACT

The IoT Enabled Smart Home Automation System is an advanced and intelligent solution designed to automate and monitor household appliances using Internet of Things (IoT) technology. This project is implemented using the ESP32 microcontroller, which has built-in Wi-Fi capability, making it suitable for real-time data communication and remote control applications. The main objective of this system is to improve user comfort, enhance home security, and reduce energy consumption. The system integrates various sensors including a Passive Infrared (PIR) sensor for motion detection, a DHT22 sensor for measuring temperature and humidity, and a Light Dependent Resistor (LDR) for detecting ambient light intensity. These sensors continuously collect environmental data and send it to the ESP32 microcontroller. Based on predefined conditions, the ESP32 automatically controls home appliances such as lights and fans. For example, lights are turned ON or OFF depending on room occupancy and light intensity, while temperature data can be used to control cooling or heating devices. Wi-Fi connectivity enables the system to communicate with the Blynk cloud platform, allowing users to monitor sensor data and control appliances through a smartphone application from anywhere in the world. The Blynk mobile application provides a user-friendly interface with real-time updates, manual control options, and notification alerts. Motion detection alerts can be sent to the user for improved home security. This smart home automation system is cost-effective, scalable, and easy to implement. It demonstrates the practical application of IoT in modern homes and can be further extended by integrating additional sensors, voice assistants, or cloud-based data analytics for enhanced functionality.

DESIGN OF RADIX-8 UNSIGNED BIT PAIR RECODING ALGORITHM-BASED FLOATING-POINT MULTIPLIER FOR NEURAL NETWORK COMPUTATIONS

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ABSTRACT

The neural network computations for Artificial Intelligence (AI) applications demand high speed, low power and area-efficient Floating-Point (FP) multiplication. In this work, we propose an efficient unsigned Bit Pair Recoding (BPR) algorithm for area, power, and speed improved FP unsigned mantissa multiplication. The partial product rows are reduced from n to n 4 for n × n binary multiplier using the BPR algorithm with parallel processed partial product reduction. The new algorithm performs partial product row reduction without the 2's complement, Negative Encoding (NE), and Sign Extension (SE) are required for Booth recoded-based multiplication but these computations are not required for floating point unsigned multiplication. The computational cost of determining a 2's complementary circuit and neglecting the sign bit extension of each partial product row in the Modified Booth Encoding (MBE) algorithm is effectively eliminated by BPR algorithm. The unsigned mantissa multiplication using partial product array reduction with the BPR technique uses 27.5% less area, 18% less power, and 33.33% improved speed for generating one partial product row than conventional Booth multipliers. The 8 × 8 and 16 × 16 multipliers are used to verify the BPR binary multipliers on TSMC 65nm 1.1 V CMOS standard cell library and the synthesis reports are compared with the conventional and best-reported improved Booth multipliers. Finally, the MAC design uses 16-bit FP arithmetic with an 8×8 mantissa multiplier for the CNN accelerator is developed, and it is validated with suitable error metrics like Mean Relative Error (MRE) to assess the suggested architecture for AI applications. Keywords Area efficient multiplier, bit pair recoding (BPR) algorithm, booth encoding algorithm, error analysis, fast multiplication, low power multiplier, multipliers for neural networks, partial product reduction.

FPGA IMPLEMENTATION SOBEL EDGE DETECTION

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ABSTRACT

Image processing is an important task in data processing systems for applications such as medical sectors, remote sensing, and microscopy tomography. Edge recognition is a sort of image division method that is used to simplify the image records so as to reduce the amount of data to be processed. Edges are considered the most important in image processing because they are used to characterize the boundaries of an image. The performance of the Canny edge recognition algorithm remarkably surpasses the present edge recognition technology in various computer visualization methods. The main drawback of using Canny edge boundary is that it consumes lot of time due to its complex computation. In order to tackle this problem a hybrid edge recognition method is proposed in the block stage to locate edges with no loss. It employs the Sobel operator estimate method to calculate the value and direction of the gradient by substituting complex processes by hardware cost savings, traditional non -maximum suppression adaptive thresholding block organization, and conventional hysteresis thresholding. Pipeline was presented to lessen latency. The planned strategy is simulated using Xilinx ISE Design Suite14.2 running on a Xilinx Spartan -6 FPGA board. The synthesized architecture usesless hardware to detect edges and operates at maximum frequency of 935 MHz.

VERILOG - BASED DESIGN AND SIMULATION OF A FULLY AUTOMATIC FOUR-WAY TRAFFIC LIGHT CONTROLLER USING VHDL TARGETING VLSI/FPGA SYSTEMS

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ABSTRACT

Rapid urbanization has led to a significant increase in traffic congestion, requiring efficient and reliable traffic management systems. This project presents the design and simulation of a fully automatic four-way traffic light controller intended for VLSI and FPGA-based implementations. The system is modeled using hardware description language techniques, combining Verilog-based design concepts with VHDL modeling to achieve accurate timing control and dependable signal operation. The proposed controller operates without human intervention and follows a predefined timing sequence to control traffic flow at a four-road intersection. Each direction is assigned red, yellow, and green signals that operate in a conflict-free manner, ensuring safety and smooth traffic movement. The design is structured using a finite state machine approach, enabling clear state transitions and easy scalability. Simulation results confirm the correct functionality of the traffic light controller, demonstrating precise signal timing and stable operation. The design is optimized for efficient hardware utilization, making it suitable for FPGA implementation and future VLSI realization. This project highlights the effectiveness of HDL-based design methodologies for real-time embedded and traffic control applications.

A DEEP LEARNING FRAMEWORK FOR RETINAL IMAGEENHANCEMENT USING U-NET ARCHITECTURE

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ABSTRACT

Retinal image enhancement plays a crucial role in the accurate diagnosis of ocular diseases such as diabetic retinopathy and glaucoma. However, retinal fundus images often suffer from low contrast, uneven illumination, and noise, which obscure important anatomical structures like blood vessels and the optic disc. To address these challenges, this work presents a deep learning–based retinal image enhancement approach using a U-Net architecture. The proposed model learns an end-to-end mapping between original retinal images and enhanced images generated through contrast-limited adaptive histogram equalization (CLAHE). The U-Net model effectively preserves fine structural details while significantly improving contrast and overall image clarity. Experiments conducted on the DRIVE dataset demonstrate that the enhanced outputs exhibit a clear and visually distinguishable improvement over the original images. The results confirm that the U-Net-based enhancement framework provides a stable and efficient preprocessing solution for computer-aided retinal disease diagnosis systems.

DESIGN AND IMPLEMENTATION OF A HIGH-SPEED 64-BIT CARRY LOOK-AHEAD DECIMAL ADDER (CLDA) USING VERILOG HDL IN XILINX VIVADO

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ABSTRACT

Decimal arithmetic is gaining increased attention from researchers due to its critical role in human-centric applications, such as financial and commercial computing. Hardware implementations of decimal arithmetic are preferred over software counterparts as they provide superior performance, particularly in real-time systems. As the foundation for most decimal operations, decimal addition remains a primary focus of hardware optimization. While decimal adders can be structured as Ripple Carry Adders (RCA), the Carry Look Ahead (CLA) structure offers significantly higher speeds by reducing carry propagation delay. This work proposes the design and implementation of high-speed 64-bit Carry Look-Ahead Decimal Adders (CLDAs). By utilizing a modular, multi-level CLA hierarchy, the architecture is scaled to handle 64-bit (16-digit) operands, ensuring rapid carry generation across large bit-widths. The architecture was modeled using Verilog HDL, focusing on optimizing the Boolean logic for high-frequency operation. The design was synthesized, implemented, and verified within the Xilinx Vivado environment. The implementation results demonstrate that by extending CLDA principles to 64-bit widths, the design achieves significant improvements in throughput and latency compared to traditional decimal addition methods, making it highly suitable for modern high-performance digital processors. Key Words: Decimal Arithmetic, Carry Look-Ahead Decimal Adder, BCD Addition, Verilog HDL, FPGA Implementation, High-Speed VLSI Design

INTEGRATED ENSEMBLE DEEP LEARNING TECHNIQUES FOR ACCURATE TOMATO LEAF DISEASE CLASSIFICATION USING THE INCVX-NET MODEL

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ABSTRACT

Automated tomato leaf disease detection is essential for early symptom identification and reducing crop losses in large-scale agriculture. Traditional methods, such as visual inspection and laboratory testing, are time-consuming, labor-intensive, and prone to human error. To address these limitations, this study proposes INCVX-Net, an integrated ensemble deep learning framework combining Inception, VGG-16, Xception, and ResNet models using weighted averaging and feature integration. Inception captures multi-scale visual features, VGG-16 and Xception enhance recognition of subtle leaf variations, and ResNet enables deeper feature learning. Evaluated on a 10-class tomato leaf dataset (nine disease categories and one healthy class), INCVX-Net achieved up to 99.5% accuracy, outperforming individual base models and existing approaches. High precision, recall, and F1-scores across all classes, along with accurate sample predictions, demonstrate its robustness and reliability. These results indicate that ensemble and integrated deep learning models can significantly improve disease detection, providing a strong foundation for early disease identification, better crop management, and enhanced yield quality in precision agriculture. Keywords Tomato leaf disease detection, Deep learning, Ensemble learning, INCVX-Net, Inception, VGG-16, exception.

IOT BASED WIRELESS SENSOR NETWORK FOR REAL-TIME MONITORING AND CONTROL OF AGRICULTURAL PARAMETERS

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ABSTRACT

Agriculture plays a vital role in the economy, and efficient monitoring of agricultural parameters is essential to improve crop productivity and resource utilization. Traditional farming methods rely heavily on manual monitoring, which is time-consuming, labor-intensive, and often inaccurate. To overcome these limitations, this project proposes an IoT-based Wireless Sensor Network (WSN) for real-time monitoring and control of agricultural parameters. In the proposed system, various sensors such as soil moisture, temperature, humidity, and water level sensors are deployed in the agricultural field to continuously collect environmental data. The sensor data is transmitted wirelessly to a microcontroller, which processes the information and sends it to an IoT cloud platform using a Wi-Fi module. Farmers can remotely monitor real-time field conditions through a web or mobile application from anywhere at any time. Based on predefined threshold values, the system can automatically control agricultural operations such as irrigation, ensuring optimal water usage and reducing human intervention. The proposed IoT-based system enhances decision-making, improves crop yield, minimizes water wastage, and reduces operational costs. This smart agriculture solution provides a reliable, scalable, and cost-effective approach for modern farming practices.

Keywords
Irrigation Control, Agricultural Field Monitoring.

CRYOGENIC EMBEDDED MEMORY BENCHMARK: SRAM VS DRAM IN 45 – NM CMOS WITH POWER GATING

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ABSTRACT

Cryogenic systems, such as quantum computers and superconducting devices, demand highly efficient embedded memory solutions that can operate reliably in extreme low-temperature environments, typically around 4.2 Kelvin. As quantum processors scale up, the need for integrated cryo-CMOS (cryogenic complementary metal-oxide-semiconductor) technologies becomes critical, particularly in minimizing wiring complexity and reducing thermal loads. In this context, this study presents a comprehensive benchmarking analysis of Static Random-Access Memory (SRAM) and Dynamic Random-Access Memory (DRAM) architectures fabricated using a 45-nanometer CMOS process under cryogenic conditions. The performance metrics analyzed include power consumption, access delay, memory density, and scalability. Special focus is placed on evaluating the effectiveness of power gating techniques, which dynamically disconnect idle memory blocks to minimize leakage currents and significantly enhance energy efficiency without compromising data integrity. Key operational challenges at cryogenic temperatures, such as leakage reduction, charge retention, threshold voltage shifts, and device variability, are systematically addressed. Simulation results demonstrate that DRAM-based architectures offer superior memory density and better power efficiency, especially at higher operational frequencies, making them highly suitable for large-scale, low-power cryogenic systems. On the other hand, SRAM cells continue to excel in applications requiring low-latency and high-reliability access but at the cost of increased static power consumption and larger silicon area.

DESIGN AND IMPLEMENTATION OF 2D FIR FILTER USING MODIFIED ADDER AND MULTIPLIER

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ABSTRACT

The design and implementation of a 2D FIR filter using modified adders and multipliers focuses on optimizing the core arithmetic units to achieve improved performance metrics such as reduced area, power consumption, and processing delay. By employing modified adders (such as Modified Carry Look-Ahead Adders) and advanced multipliers (including Radix-2r or Vedic multipliers), the 2D FIR filter architecture enhances the efficiency and speed of convolution operations performed on two-dimensional data, typical in image and signal processing. The modified multipliers reduce the number of partial products and simplify the addition steps, while the optimized adders accelerate carry propagation, together significantly minimizing computational delay and energy usage. This leads to a compact hardware footprint and power-efficient operation, making the design highly suitable for real-time applications

DESIGN AND SIDE-CHANNEL VULNERABILITY ANALYSIS OF AN AREA OPTIMIZED AES CRYPTO-CORE FOR RISC-V HIGH-SECURITY APPLICATION

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ABSTRACT

As Internet-of-Things (IoT) edge devices increasingly handle sensitive data, the demand for high-security, resource-constrained hardware has grown. This paper presents the design and implementation of an area-efficient Advanced Encryption Standard (AES) cryptographic core integrated into a 32-bit RISC-V Instruction Set Architecture (ISA). To meet the stringent area and power constraints of embedded high-security applications, the proposed AES core employs Composite Field Arithmetic (CFA) for the Substitution-Box (S-box) transformation, effectively reducing the silicon footprint compared to traditional Look-Up Table (LUT) based designs. Furthermore, fine-grained clock-gating techniques are integrated to minimize dynamic power consumption during idle encryption rounds.

While these optimizations improve hardware efficiency, they alter the power profile of the core, potentially introducing vulnerabilities to physical attacks. This research performs a rigorous evaluation of Power Side-Channel Attacks (SCA), specifically focusing on Correlation Power Analysis (CPA). We analyze how area-optimization techniques, such as CFA-based S-boxes, impact the signal-to-noise ratio of power traces and the subsequent success rate of key recovery. The design is validated using Xilinx Vivado for FPGA synthesis and power estimation. Experimental results demonstrate that the integrated crypto-core achieves a significant reduction in gate count and power overhead while providing a baseline for analyzing the trade-offs between hardware efficiency and side-channel resistance in modern RISC-V security subsystems.

Keywords

RISC-V, AES, Power Side-Channel Attack, Composite Field Arithmetic, Clock Gating, VLSI Design, High-Security Applications.

IOT BASED FIRE RISK MONITORING AND AUTOMATIC PASSENGER EVACUATION SYSTEM FOR BUSES

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ABSTRACT

Fire accidents in buses—AC and non-AC—are becoming increasingly common due to wiring faults, engine overheating, fuel leakage and lack of early safety actions. Most buses only detect fire but do not assist in passenger evacuation or automatically control the vehicle during emergency situations. To overcome these limitations, this project proposes a Universal IoT-Based Fire Detection, Prevention and Automatic Passenger Evacuation System for Buses. The system uses multiple sensors such as temperature, smoke and current sensors placed near the engine area, battery compartment and wiring harness to detect early fire-risk conditions. A microcontroller (ESP32) continuously monitors these sensors and triggers emergency actions when abnormal values are detected. When a critical fire risk is identified, the system activates the prevention module, which automatically reduces the bus speed and brings the vehicle to a safe halt using an ignition/throttle control relay. At the same time, the automatic evacuation module is activated. This module automatically opens the emergency doors and emergency windows using servo or solenoid mechanisms, ensuring passengers can escape without depending on the driver. To help passengers quickly identify exits, LED indicators and buzzers mounted on every emergency door and window turn on instantly. The driver receives an immediate alert through a buzzer and a message displayed on the driver screen, informing about the detected fire risk and triggered safety actions. By combining multi-sensor fire detection, automatic vehicle control and automatic evacuation features, the proposed system significantly enhances passenger safety. It allows quick evacuation even in panic situations, smoke-filled conditions or when the driver is unable to respond. The system is cost-effective, easy to install and suitable for all types of buses, making it a practical solution to reduce bus fire-related injuries and fatalities.

Keywords
IoT, Fire Detection, Automatic Evacuation, Emergency Door Opening, Emergency Window Opening, Multi-Sensor System, Bus Safety, Speed Reduction, Passenger Alert System

DESIGN AND ENERGY-EFFICIENT CNN ACCELERATOR FOR EDGE AI

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ABSTRACT

The rapid advancement of Artificial Intelligence (AI) at the network edge has increased the demand for energy-efficient hardware accelerators capable of performing real-time deep learning inference under strict power and latency constraints. Edge devices such as IoT sensors, smart phones, wearables, and smart surveillance systems require localized AI processing to reduce latency, energy consumption, and privacy risks associated with cloud-based computation. This project presents the design and architectural optimization of an energy-efficient CNN accelerator for Edge AI applications. The proposed accelerator utilizes a customized dataflow and a scalable systolic array architecture to minimize off-chip memory accesses, which are a major source of energy consumption in deep neural network execution. A hierarchical on-chip memory system using SRAM buffers enhances data reuse and improves performance per watt. Energy efficiency is further enhanced through low-precision computation, sparsity-aware processing, weight pruning, and dynamic voltage and frequency scaling (DVFS). Micro architectural techniques such as clock gating and power gating are employed to reduce switching and leakage power. The accelerator is synthesized using CMOS technology and evaluated against conventional CPU and GPU-based platforms. Experimental results demonstrate significant improvements in performance-per-watt, reduced latency, and lower energy consumption while maintaining acceptable accuracy on standard CNN workloads. The proposed architecture provides a scalable and modular solution suitable for a wide range of Edge AI applications.

VLSI FOR QUANTUM COMPUTING INTERFACES

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ABSTARCT

Quantum computing exploits qubits, which can exist in superposition, enabling exponential speed-up for certain computational problems compared to classical computers. However, qubits operate at millikelvin temperatures and are highly sensitive to noise, requiring precise control and readout electronics. Classical systems alone cannot meet these requirements efficiently due to thermal, latency, and noise limitations.

VLSI technology provides compact, low-power, and high-performance circuits for qubit control and readout, enabling scalable quantum-classical interfaces. Integration of VLSI circuits close to qubits reduces wiring, latency, and interference, allowing larger qubit arrays to be controlled reliably.

Key Idea:

Integrate Cryo-CMOS VLSI circuits directly into the quantum environment for precise, low-latency control.

DESIGN OF A LOW-POWER QUATERNARY FULL ADDER BASED ON GNRFET TECHNOLOGY

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ABSTRACT

In this study, graphene nano ribbon field-effect transistors (GNFETs) are used to create quaternary logic and arithmetic circuits, and their performance is carefully assessed. The suggested work illustrates the efficient use of GNFET technology in the development of quaternary inverters, logic gates, decoders, and arithmetic units like half adders and full adders. It is motivated by the benefits of multi-valued logic (MVL) over traditional binary systems. According to simulation results, the suggested GNFET-based quaternary circuits perform better than the current CNFET-based designs, reducing power consumption by up to 21.76%, improving propagation delay by nearly 20%, and increasing power-delay product (PDP) for the entire adder circuit by up to 71.52%. GNFET implementations offer notable advantages in latency, power dissipation, and total energy efficiency, according to comparative analysis. Additionally, the scalability of the suggested method for building more intricate arithmetic systems is demonstrated by the modular complete adder design. HSPICE simulations were used to model and validate circuit-level behaviour and device current-voltage characteristics. All things considered, our work highlights the great potential of GNFETs as an effective substitute for creating high-performance, low-power MVL circuits in upcoming nano electronic applications.

WIRELESS SENSOR NETWORK MODERN NURSERY FARMING

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ABSTRACT

The aim of the project is Real-Time IoT-based Wireless Sensor Network for improving crop health and nutrient management in modern nursery agriculture. The system uses a Raspberry Pi PICO microcontroller connected to different sensors such as the NPK sensor, soil moisture sensor, DHT11 temperature–humidity sensor, light sensor, and a photosynthetic sensor. These sensors continuously collect data about soil nutrients, moisture level, temperature, humidity, and light conditions. The RPI PICO processes the collected data using suitable software and sends the information to a server through IoT. The system also controls different devices like an LCD display, DC fan, and AC water pump based on the sensor readings. This helps in automatic irrigation, maintaining proper temperature. By using IoT, farmers can monitor their nursery plants from anywhere and receive real-time updates. This system reduces manual work, saves water, increases crop growth, and supports smart agriculture. Keywords Wireless Sensor Network (WSN), Smart Agriculture, Nursery Crop Monitoring, Raspberry Pi Pico, Automated Irrigation System, Real-Time Data Monitoring, Crop Health Management

IoT CONTROLLED SANITIZE ROBOT USING MULTI-SENSOR NAVIGATION WITH ESP32-CAM

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ABSTRACT

This project presents an IoT-controlled sanitizing robot that integrates multi-sensor navigation using an ESP32 module and ESP32-CAM for enhanced environmental awareness and autonomous operation. Fire, gas, and obstacle sensors work together to detect hazards and guide safe movements, while the ESP32 processes all sensor inputs and controls the motors and pump for targeted disinfection. The ESP32-CAM provides real-time visual monitoring, and IoT connectivity enables remote control, live feedback, and data access from anywhere. A 12V battery powers the system, and the inclusion of an LCD and control button improves user interaction. Designed for efficient, touch-free sanitization in homes, hospitals, and public facilities, this robot offers a smart and reliable solution for automated disinfection applications.

Keywords
IoT-Based Sanitizing Robot, ESP32, ESP32-CAM, Autonomous Navigation, Multi-Sensor System, Fire and Gas Detection, Obstacle Avoidance, Remote Monitoring, Automated Disinfection, Touch-Free Sanitization

MASTER OF COMPUTER APPLICATIONS

MISINFORMATION REGULATION IN THE PRESENCE OF COMPETITION BETWEEN SOCIAL MEDIA PLATFORMS

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ABSTRACT

Social media platforms often hesitate to enforce strict content moderation because relaxed rules can provide a competitive advantage. If a popular platform introduces strong regulations, it risks losing users to alternative platforms with fewer restrictions. This makes regulation less effective, especially when harmful content continues to spread on other platforms. As a result, platforms, users, and news sources all influence which moderation policies can survive in practice. This study analyzes content moderation as a competitive interaction among platforms, news sources, and users, and identifies the policies that remain stable in equilibrium. Using social network models, it shows that strict regulation can be successful without user loss under certain conditions, such as controlled news diffusion, strong community connections, high quality user interactions, and limited preference for sensational content from influencers.

KeywordsEquilibrium Outcome, Community Structure, Content Moderation Policy.

PREDICTING SIDE EFFECT OF DRUG MOLECULES USING RECURRENT NEURAL NETWORKS

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ABSTRACT

Predicting the side effects of drug molecules is a critical and time-intensive stage in drug discovery, as undetected adverse effects can lead to severe financial losses, regulatory delays, and potential risks to human life. Traditional approaches for side-effect prediction rely on complex machine learning models with large parameter sizes, making them computationally expensive and difficult to deploy without high-performance infrastructure. To address these challenges, this project proposes a lightweight and efficient machine learning approach using Recurrent Neural Networks (RNNs), specifically the Gated Recurrent Unit (GRU) architecture, for predicting drug molecule side effects. Molecular structures are represented using SELFIES, which simplifies molecular grammar and ensures syntactic validity compared to conventional SMILES representations. The proposed model significantly reduces model complexity, achieving a 98%+ reduction in parameters while maintaining performance comparable to state of the-art methods. Experimental evaluation on benchmark molecular datasets demonstrates that the proposed GRU-based approach delivers accurate and reliable side effect predictions, offering a cost-effective and scalable solution for early-stage drug safety assessment.

KeywordsDrug Side Effect Prediction, Recurrent Neural Networks, GRU, Machine Learning, SELFIES, SMILES, Molecular Property Prediction, Drug Discovery, Deep Learning

HEALTHCARE ECONOMICS-VITAL THREAT DETECTIONSYSTEM EFFICIENCY: A BUSINESS PROCESSANALYSIS METHODOLOGY

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ABSTRACT

Continuous monitoring of vital signs is very important in healthcare, especially for elderly people and patients with long-term diseases. Many times, health problems are detected late because doctors cannot monitor patients all the time. This delay can cause serious emergencies. To solve this problem, this study introduces Safe Pulse, a smart healthcare system designed using a business process analysis approach to improve the efficiency of health monitoring.

Safe Pulse uses a smart-watch to collect vital data such as heart rate, blood pressure, and glucose levels through IoT technology. This data is sent to the cloud and analyzed using AI to find any abnormal health conditions. If a problem is detected, instant alerts are sent to family members or caregivers through a mobile app, so they can take quick action. The system is flexible, scalable, and helps improve healthcare quality by providing real-time monitoring and early warning of health risks.

KeywordsHealthcare Monitoring, Vital Signs Detection, Internet of Things (IoT), Artificial Intelligence (AI), Smart watch Technology, Remote Patient Monitoring.

ENHANCING FRAUD DETECTION IN BANKING WITH DEEP LEARNING: GRAPH NEURAL NETWORKS AND AUTOENCODERS FOR REAL TIME CREDIT CARD FRAUD PREVENTION

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ABSTRACT

The rapid growth of digital banking and online transactions has significantly increased the risk of credit frauds demanding more accurate and real time detection systems. Traditional machine learning approaches often struggle to capture complex relationships among transactions and users, leading to delayed or inaccurate fraud identifications. This work proposes an enhanced fraud detection framework for banking systems using deep learning techniques, specially graph neural networks (GNNs) and Autoencoders. GNNs are employed to model transactional data as graphs, effectively learning hidden patterns and relationships between cardholders, merchants and transaction. Autoencoders are utilized for anomaly detection by identifying deviations from normal transaction behavior. The integration of these models enables real time fraud detection with improved accuracy, reduced false positives, and faster response times. Experimental results demonstrate that the proposed approach outperforms traditional methods, making it suitable for scalable and robust credit card fraud prevention in modern banking environment. Overall, the research shows how DL can prevent the fraud detection in banking and credit card frauds. Reduce the risk of frauds in real time transactions.

KeywordsCredit card fraud detection, banking security, deep learning, graph neural networks (GNNs), Autoencoders, real time transactions.

ENHANCING MOBILE APP RECOMMENDATIONS WITH CROWD SOURCED EDUCATIONAL DATA USING MACHINE LEARNING AND DEEP LEARNING

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ABSTRACT

In the rapidly evolving digital landscape, personalized recommendations have become essential for enhancing user experience. Machine learning models analyze user behavior patterns to suggest relevant entertainment, education, or e-commerce content. Mobile devices make it easier to gather educational data through crowd sourcing, which opens new possibilities for improving app recommendation algorithms. This paper provides valuable methodologies for scalable student recommendation and educational systems, highlighting DL's advantages over CF in handling sparse, time-sensitive datasets. The objective of this study is to recommend apps to university students by category based on app usage patterns. Data was used to evaluate these 806 university students to train the Collaborative Filtering (CF) and Contemporary Deep Learning (DL) models. The results demonstrate that Gated Recurrent Units (GRU) are the best option for real-time, customized suggestions because of their capacity to simulate successive interactions and adjust to changing user behavior. The GRU yields the lowest mean errors MAE of 0.2246, RMSE=0.2516, and superior short-term predictions k=4 MAE of 0.1319 and RMSE of 0.1319. Other techniques, i.e., Stacked Auto-Encoder, exhibit the sign of over fitting with an MAE of 0.0001, whereas the LSTM and Graph Auto-Encoder perform below GRU with an MAE of 0.3453 and 0.8992. Although the CF techniques suffer from temporal dynamics and data sparsity, even the KNNBasic stands out among all CF algorithms with the lowest MAE of 0.548 and RMSE of 0.754, demonstrating the highest predictive accuracy.

KeywordsMobile App Recommendation, Machine Learning, Deep Learning, Crowdsourced Educational Data, Personalized Learning, Artificial Intelligence, Collaborative Filtering.

AN ATTENTION-BASED DEEP LEARNING APPROACH FOR DRIVER DROWSINESS DETECTION IN INTELLIGENT TRANSPORTATION SYSTEM

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ABSTRACT

Road accidents caused by driver drowsiness are a major concern in intelligent transportation systems. Fatigue and loss of alertness significantly reduce a driver's reaction time, leading to serious accidents, injuries, and loss of life. Traditional monitoring systems are often unreliable and fail to detect drowsiness accurately in real time. This project presents an attention-based deep learning framework for driver drowsiness detection in intelligent transportation systems. The proposed model uses deep learning techniques combined with an attention mechanism to effectively analyze facial features such as eye closure, blinking rate, and head movement. The attention mechanism helps the model focus on the most important visual features, improving detection accuracy and robustness. The system is designed to work in real-time and can alert drivers when drowsiness is detected, thereby enhancing road safety. Experimental results demonstrate that the proposed approach outperforms traditional machine learning methods in terms of accuracy and reliability, making it suitable for real-world transportation applications.

KeywordsDriver Drowsiness Detection, Deep Learning, Attention Mechanism, Intelligent Transportation System.

REAL TIME DISTRIBUTED CHARGING STATION RECOMNENDATION FOR ELECTRIC VEHICLES: A FEDERATED META RL APPROACH

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ABSTRACT

The growth of Electric Vehicles (EVs) places an increasingly heavy burden on the limited charging infrastructure, necessitating an effective charging station recommendation strategy that assists EVs in finding the most suitable charging stations. Deep reinforcement learning is a promising technology that has been applied to optimize EVs' charging recommendations. However, existing schemes have low scalability and high communication costs as they usually require collecting real-time information on both charging requests and charger availability at various stations during policy training or execution. To address this challenge, we develop a real-time distributed charging station recommendation approach, named Redirect, to minimize the charging duration experienced by EVs, considering dynamic charging requests of EVs and fluctuating availability at charging stations.

KeywordsElectric Vehicles (EV), Charging Station Recommendation, Real-Time Charging Management.

SUPPLY CHAIN CHARACTERISTICS AS PREDICTORS OF CYBER RISK A MACHINE LEARNING ASSESSMENT

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ABSTRACT

The increasing digitalization of supply chains has significantly improved operational efficiency but has simultaneously expanded the attack surface for cyber threats. Modern supply networks involve multiple interconnected partners, third party vendors, cloud platforms, and information systems, making them vulnerable to cyber risks that can propagate rapidly across organizations. This study investigates how specific supply chain characteristics can serve as predictors of cyber risk using machine learning techniques. Key structural and operational factors—such as supplier concentration, network complexity, geographic dispersion, information sharing intensity, dependency levels, and third-party integrations—are analyzed to understand their influence on cybersecurity exposure. A dataset combining supply chain attributes and historical cyber incident records is constructed and preprocessed to extract meaningful features. Various machine learning models, including logistic regression, decision trees, random forests, and gradient boosting, are applied to classify and predict the likelihood of cyber incidents. Model performance is evaluated using accuracy, precision, recall, F1-score, and ROC-AUC metrics. The results demonstrate that supply chain complexity, high vendor interdependency, and extensive digital integration are strong predictors of elevated cyber risk. Feature importance and interpretable modeling techniques further provide insights into critical risk drivers. The proposed framework enables organizations to proactively assess vulnerabilities, prioritize mitigation strategies, and enhance supply chain resilience. By integrating machine learning with supply chain risk management, this research contributes a data-driven approach for predicting and managing cyber threats in interconnected business ecosystems.

KeywordsSecurity, integrity, and protection, machine learning, risk management, data sharing.

PREDICTION OF HIGHER EDUCATION ACHIEVEMENT BY MINING PATTERNSFROM HEALTH RECORDS AND SOCIO ECONOMIC STATUS

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ABSTRACT

The combination of health records with socio-economic status and educational achievement has attracted much attention as scholars look for factors that affect students' performance. New research focuses on the application of the predictive model that utilizes data mining methods for discovering associations between these factors. Using records of health and socio-economic status, academics try to find out predictors that can predict students' success in higher education.

To perform this systematically, we propose the use of one way analysis of variance (ANOVA) and Laplacian score to rank the factors. The involvement of these factors is helpful in broadening the view of the prediction of educational progress landscape. In addition, we improve the performance of our combinatorial classification by applying the Error Correcting Output Codes (ECOC) technique. The findings show that the use of one-way ANOVA in combination with Laplacian score and the ECOC method allowed obtaining a significantly lower FPR and at the same time a higher TPR, which means that the predictions of the educational progress as the higher education achievement are more accurate.

KeywordsStudent Health Data, Socio-Economic Status, Academic Achievement.

ADVANCES IN AI AND BLOCK CHAIN TECHNOLOGIES: FOR EARLY DETECTION OF HUMAN DISEASES

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ABSTRACT

The rapid growth of Artificial Intelligence (AI) and Blockchain technologies is transforming the healthcare sector, particularly in the early detection and management of human diseases. AI techniques such as machine learning and deep learning enable efficient analysis of large scale medical data, including clinical records, medical images, and real-time patient monitoring data. These intelligent systems can identify disease patterns, predict health risks, and support medical professionals in making accurate and timely diagnoses. Blockchain technology complements AI by providing a secure, transparent, and decentralized platform for storing and sharing healthcare data. It ensures data integrity, privacy, and trust among healthcare stakeholders while enabling consent-based access to sensitive patient information. By integrating AI with Blockchain, healthcare systems can achieve reliable data sharing, improved diagnostic accuracy, and enhanced patient-centered care. This paper highlights recent advancements in AI-driven disease prediction models and Blockchain-based healthcare data management frameworks. It discusses how their combined implementation improves early disease detection, reduces diagnostic errors, and strengthens data security. The integration of these emerging technologies offers a promising solution for building efficient, secure, and intelligent healthcare systems for future medical applications.

KeywordsArtificial Intelligence, Blockchain Technology, Early Disease Detection, Healthcare Security.

CYBER ATTACK PREDICTION: FROM TRADITIONAL ML TO GENERATIVE AI

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ABSTRACT

Cyber threats are increasing and becoming more advanced. This creates serious risks for individuals, organizations, and countries. Cybercrime, such as hacking and data theft, causes major financial and social damage. Traditional security systems cannot keep up with these fast changing threats. Artificial Intelligence (AI) provides powerful tools to improve cybersecurity. This paper studies how Machine Learning, Deep Learning, Natural Language Processing, Explainable AI, and Generative AI can help detect and prevent cyber-attacks. It compares ML and DL methods based on accuracy and usefulness. It also explains how Explainable AI makes security systems more transparent. The paper explores how Generative AI and NLP can be used for threat detection, attack simulation, and threat intelligence. Overall, the research shows how AI can strengthen cybersecurity and help reduce cyber risks in real-world systems.

Keywords Cybersecurity, Threat Detection, AI-Driven Security.

A MULTI-FACETED APPROACH TO TRENDING TOPIC ATTACK DETECTION USING SEMANTIC SIMILARITY AND LARGE-SCALE DATASETS

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ABSTRACT

The widespread use of social media platforms such as Twitter has made trending hashtags an attractive target for malicious actors seeking to promote spam, misinformation, and harmful content through trending topic attacks. These attacks exploit popular hashtags by attaching unrelated or deceptive content, misleading users and accelerating the spread of spam. This project presents a multi-faceted approach for detecting trending topic attacks by focusing on the semantic consistency between tweet content and associated hashtags. Unlike traditional feature-based methods, the proposed system emphasizes semantic similarity by integrating WordNet-based semantic analysis with Sentence-Transformers for contextual understanding. Large-scale, high-quality datasets consisting of 28,000 English tweets and 7,000 Arabic tweets were curated and pre-processed using language-specific techniques. To overcome data scarcity, an effective data augmentation strategy was employed to improve model robustness. The system was evaluated using multiple machine learning classifiers, including Random Forest, Decision Tree, K-Nearest Neighbours, Gradient Boosting, andXGBoost. Experimental results demonstrate superior performance, achieving F1-scores of 96% for English and 97% for Arabic, significantly outperforming existing baseline methods. The proposed approach establishes a reliable and scalable solution for identifying trending topic attacks across multiple languages on social media platforms.

KeywordsTrending Topic Attack, Semantic Similarity, Social Media Security, Machine Learning, WordNet, Sentence-Transformers, Spam Detection, Twitter Analysis, Multilingual Text Classification

ABNORMAL ELECTRICITY CONSUMPTION DETECTION METHOD FOR SMART GRID USING FUSION MATRIX COMPLETION AND IMPROVED CLUSTERING ALGORITHM

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ABSTRACT

With the rapid development of smart grid technology, large volumes of electricity consumption data are continuously generated through smart meters. Monitoring this data is essential to detect abnormal usage such as electricity theft, meter tampering, and unusual load behavior. Traditional detection methods face challenges like missing data, noise, dependence on labeled datasets, and weak data privacy protection.

To address these issues, this project proposes a system that uses Fusion Matrix Completion and an Improved Clustering Algorithm for abnormal electricity consumption detection. Matrix completion is used to recover missing data while preserving user privacy. The system performs both horizontal analysis (comparison among users) and vertical analysis (comparison of current and historical usage of the same user) to accurately identify abnormal patterns. An improved K-Means clustering method along with Robust PCA is applied to handle noise and outliers without requiring labeled data.The proposed system improves detection accuracy, reduces manual inspection, ensures data privacy, and provides an efficient solution suitable for real world smart grid applications.

KeywordsSmart Grid, Matrix Completion, Abnormal Electricity Detection, K-Means Clustering, Data Privacy, ROBPCA.

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ADDRESSING URBAN FOOD INSECURITY THOUGH DATA-DRIVEN AND COMMUNITY-CENTRIC SMART CITY FRAMEWORKS

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ABSTRACT

Urban food insecurity is an increasingly complex socio-technical challenge driven by rapid urbanization, fragmented supply chains, economic disparity, and limited real-time decision support systems. This project proposes a data-driven, community-centric smart city framework that integrates heterogeneous urban datasets to enable predictive, adaptive, and equitable food distribution mechanisms.

The framework leverages multi-source data, including IoT-enabled supply chain monitoring, geospatial information systems (GIS), demographic datasets, market price indices, and community feedback streams. Machine learning models such as time-series forecasting (ARIMA/LSTM) and supervised classification algorithms are employed to predict food demand fluctuations, identify at-risk populations, and detect emerging supply disruptions. Spatial analytics and clustering techniques are utilized to map food deserts and optimize last
mile distribution routes.

A participatory digital platform is incorporated to facilitate real-time community reporting, local vendor integration, and coordination with food banks and municipal Authorities. The system architecture follows a layered smart city model comprising data acquisition, data processing and analytics, decision support, and service delivery layers. By combining predictive analytics, spatial intelligence, and community engagement mechanisms, the proposed framework enhances urban food system resilience, improves allocation efficiency, and supports data-informed policymaking for sustainable food security management.

KeywordsUrban Food Insecurity, Smart City Framework, Data-Driven Decision Making, Community-Centric Systems, Predictive Analytics, Machine Learning, Time-Series Forecasting.

PRIVACY-PRESERVING KEYWORD SEARCH WITH ACCESS CONTROL FOR SECRET SHARING-BASED DATA OUTSOURCING

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ABSTRACT

With the rapid growth of cloud-based data storage and information sharing systems, ensuring data privacy and secure access has become a critical challenge. Privacy-preserving keyword search with access control for secret sharing addresses the problem of searching encrypted data without revealing sensitive information. In this approach, secret sharing techniques are employed to divide sensitive data into multiple shares, ensuring that no single entity can reconstruct the original data without proper Authororization. Keyword search operations are performed over encrypted data while preserving user privacy and preventing information leakage. Access control mechanisms are integrated to ensure that only Authororized users can retrieve and reconstruct the secret data based on predefined access policies. This method enhances data confidentiality, prevents unAuthororized access, and improves trust in secure data-sharing environments. The proposed framework supports secure collaboration, efficient search functionality, and robust privacy protection, making it suitable for applications in cloud computing, healthcare, and secure document management systems.

KeywordsPrivacy-preserving search, keyword search, access control, secret sharing, data security.

LGB- LANGUAGE MODEL AND GRAPH NEURAL NETWORK DRIVEN SOCIAL BOT DETECTION

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ABSTRACT

Malicious social bots achieve their malicious purposes by spreading misinformation and inciting social public opinion, seriously endangering social security, making their detection a critical concern. Recently, graph-based bot detection methods have achieved state-of-the-art (SOTA) performance.

However, our research finds many isolated and poorly linked nodes in social networks, as shown which graph-based methods cannot effectively detect. To address this problem, our research focuses on effectively utilizing node semantics and network structure to jointly detect sparsely linked nodes. Given the excellent performance of language models in natural language understanding, we propose a novel social bot detection framework LGB, which consists of two main components: language model and graph neural network.

Specifically, the social account information is first extracted into unified user textual sequences, which is then used to perform supervised fine-tuning of the language model to improve its ability to understand social account semantics. Next, the semantically enriched node representation is fed into the pretrained GNN to further enhance the node representation by aggregating information from neighbors. Finally, LGB fuses the information from both modalities to improve the detection performance of sparsely linked nodes. Extensive experiments on two real-world datasets demonstrate that LGB consistently outperforms state of-the-art baseline models by up to 10.95%. LGB is already online.

KeywordsSocial Bot Detection, LGB Language Model, Graph Neural Network, Natural Language Processing, Social Network Analysis.

DEEP-LEARNING APPROACH FOR AN ANALYSIS OF REAL-ESTATE PRICES AND TRANSACTIONS

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ABSTRACT

The real-estate sector has experienced rapid growth in recent years, driven by increasing urbanization, economic development, and technological advancement. Property valuation and transaction analysis have become critical tasks for buyers, sellers, investors, and financial institutions. However, real-estate prices are influenced by multiple dynamic factors such as location, infrastructure, economic conditions, demand-supply fluctuations, and time-based market trends. Traditional statistical methods and basic machine learning models often struggle to capture complex and non-linear relationships within such large-scale datasets.

With the availability of historical property transaction data, deep learning techniques provide a powerful approach for analyzing and predicting real-estate prices more accurately. This study proposes a deep-learning-based framework for real-estate price prediction and transaction trend analysis. The proposed system performs data collection, preprocessing, feature engineering, and model training using Deep Neural Networks to learn hidden patterns from historical data. The framework enhances prediction accuracy, reduces human bias in valuation, and supports intelligent decision-making. By leveraging advanced deep learning models and analytical techniques, the system provides reliable insights into property price trends and market behavior.

KEYWORDSReal Estate Analysis, Deep Learning, Property Price Prediction, Neural Networks, Transaction Analysis, Machine Learning, Data Mining, Market Trends.

SAFETRAX: SMART COLLISION PREDICTION AND ALERT SYSTEM USING IOT FOR SUSTAINABLE TRAFFIC SAFETY

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ABSTRACT

With the rise in traffic accidents worldwide, it has become very important to have a more effective way to ensure road safety. To address this issue, we have made a system called SafeTrax. SafeTrax uses deep learning to predict traffic accidents and car crashes. Additionally, it has been implemented with the Internet of Things (IoT) to gather real-time data from sensors, and AWS Greengrass to process that data quickly and give drivers timely warnings.

Unlike old safety systems, SafeTrax can predict if an accident might happen. It warns drivers beforehand to make roads safer for cars, people, and other animals. SafeTrax uses video frames from camera sensors in cars to look for dangers. It then uses a special deep-learning program to figure out if a crash might happen. One important part of SafeTrax is the integration of AWS IoT Greengrass. It helps the system work faster by using cloud services on devices like the Raspberry Pi. This means the system can quickly check the data and send warnings in time. SafeTrax can ensure safer roads, and it can help save lives.

KeywordsSafeTrax, Collision Prediction, IoT, Deep Learning, Traffic Safety, Real-Time Alert System.

OPEN-SET RECOGNITION IN UNKNOWN DDOS ATTACKS DETECTION WITH RECIPROCAL POINTS EARNING

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ABSTRACT

The Internet, a cornerstone of modern life, has profound implications across personal, business, and society. However, its widespread use has posed challenges, especially concerning privacy and cyber security. Besides, the threats on the internet are increasing in terms of danger, intensity, and complexity. Distributed Denial-Of-Service (DDoS) attacks have emerged as a common and dangerous Cybersecurity threat capable of disabling the Network Systems of targeted organizations and services. Therefore, various security strategies, such as firewalls and Intrusion Detection Systems (IDS), are employed to protect against DDoS attacks. Enhancing the defensive capabilities of IDS systems through Machine Learning (ML) and Deep Learning (DL) technologies is a significant trend nowadays. However, despite notable successes, detecting DDoS attacks using ML and technologies still faces challenges, especially with Unknown DDoS Attacks.

KeywordsDistributed Denial-Of-Service, Intrusion Detection Systems, Machine Learning, Deep Learning, Open-Set Recognition, Reciprocal Points Learning, Known Attacks and Unknown Attacks.

ENHANCING SOCIAL MEDIA USERS TRUST: A COMPREHENSIVE FRAMEWORK FOR DETECTING MALICIOUS PROFILES USING MULTI-DIMENSIONAL ANALYTICS

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ABSTRACT

Information transparency, user privacy, and digital security in online social networks are increasingly threatened by the rapid growth of counterfeit bot accounts. Traditional detection methods rely on limited features, reducing their effectiveness against sophisticated malicious behaviors. This study proposes a Fake Bot Account Detection (FAD) framework that uses advanced deep learning techniques to analyze multi modal data, including visual content, temporal activity patterns, and network interactions. By combining these diverse features into a unified representation, the model identifies whether an account is genuine or malicious.

Experimental evaluation on the Cresci-2017 data set demonstrates improved detection accuracy compared to conventional methods. The results show that integrating multi modal data provides a robust and reliable solution for enhancing the security of online social networks.Overall, the proposed multi modal deep learning framework effectively improves fake bot detection by combining diverse data features, resulting in higher accuracy and enhanced security for online social networks.

KeywordsFake Bot Detection; Deep Learning; Social Network Security; Malicious Profiles; Online Social Networks (OSN s); Multidimensional Analytics

PERSONALIZED SOLUTIONS FOR FOOT HEALTH: MACHINE LEARNING-BASED FOOT CONDITION DETECTION, CLASSIFICATION, AND RECOMMENDATION OF CUSTOMIZED FOOTWEAR

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ABSTRACT

Foot health disorders such as flat foot, high arch, plantar fasciitis, and pressure imbalance are increasingly common and often remain undetected until they cause severe discomfort or long term complications. Traditional foot assessment methods rely heavily on manual examination by specialists, which can be subjective, time-consuming, and inaccessible to many individuals. This paper proposes an intelligent machine learning-based system for automatic detection and classification of foot conditions using plantar foot images and pressure distribution data. A Convolutional Neural Network (CNN) model is employed to analyze foot patterns and identify abnormalities with high accuracy. Based on the detected condition, the system provides personalized footwear recommendations, including arch support, cushioning level, and insole design. The proposed approach enables early detection, remote assessment, and customized intervention, thereby improving foot health management and user comfort.

Keywords—Foot health analysis, Machine learning, Convolutional Neural Network, Foot condition detection, Customized footwear recommendation.

PUBLICPULSE: A SOCIAL MEDIA ANALYSIS FRAMEWORK FOR CITIZEN REACTIONS TO GOVERNMENT ACTIONS.

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ABSTRACT

Social media has grown significantly, attracting more people who spend more time on these platforms and share vast amounts of information about their daily lives. Consequently, governments use such social media to disseminate information about their achievements, updated laws, and decisions.

Simultaneously, citizens find social media platforms, such as Facebook, X (previously known as Twitter), and Instagram Public Pulse a Social Media Analysis Framework for Citizen Reactions to Government Actions, appealing virtual spaces for expressing their thoughts and opinions. In brief, social media is becoming an increasingly vital channel of communication between governments and citizens. As a result, analyzing social media data to understand and predict public sentiment in the context of government related events has become increasingly important. While sentiment analysis methods can be employed to mine sentiment from individual posts, estimating collective public sentiment about an event remains challenging. Specifically, sentiment analysis methods are associated with inaccuracies, and a group of individuals may express contradicting opinions about the same event. To address these challenges, we propose a novel framework named “Public Pulse”, designed to analyze social media posts and their associated metadata. Public Pulse incorporates a set of sentiment analysis methods along with statistical analysis to generate a public sentiment score for a set of posts related to a specific event

KeywordsPublic Pulse, Social Media Analysis, Sentiment Analysis, Government Actions, Public**,** Opinion, Machine Learning, Social Media Data, Citizen Reactions

IDENTIFICATION OF EARTHQUAKE PRECURSORS ORIGIN AND AN AI FRAMEWORK FOR AUTOMATIC CLASSIFICATION OF A SEISMIC PRECURSOR

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ABSTRACT

Earthquake detection primarily depends on the accurate identification of the P-wave arrival in seismic records. However, several signal patterns, known as precursory signals, often appear before the P-wave arrival. These signals may originate from either instrumental artifacts or natural ground effects. Misinterpretation of such precursory signals can lead to errors in P wave picking and inaccurate estimation of earthquake parameters. In this study, earthquake precursory signals were analyzed using seismic data recorded at different sampling rates (50, 100, and 200 samples per second) from the New Abu Dabbab seismic station. A total of 429 earthquake events were examined using spectral analysis to identify the origin of these precursory patterns. The results revealed that the ramping-type precursor is an instrumental artifact caused by the finite impulse response (FIR) filter of the digitizer, whereas other precursory patterns originate from natural ground effects and are independent of the sampling rate. To automate the identification of these precursors, several machine learning models along with a Convolutional Neural Network (CNN) were developed and evaluated. Among all the tested models, the CNN achieved the highest classification accuracy of 97.67% due to its capability to automatically extract discriminative features from seismic signals. The proposed automated classification framework enhances real-time P-wave detection and significantly reduces timing errors in earthquake monitoring systems.

KeywordsEarthquake precursors, P-wave detection, Seismic signal classification, Machine learning, Convolutional Neural Network (CNN), Instrumental artifacts, Spectral analysis

A VERIFIABLE AND SECURE INDUSTRIAL IOT DATA DEDUPLICATION SCHEME WITH REAL-TIME DATAINTEGRITY CHECKING IN FOG ASSISTED CLOUD ENVIRONMENTS

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ABSTRACT

The rapid growth of Industrial Internet of Things (IoT) systems has led to an enormous volume of data being generated and stored in cloud environments, resulting in high storage costs and increased security risks. Data deduplication is an effective technique to eliminate redundant data and improve storage efficiency; however, traditional deduplication schemes often compromise data privacy, integrity, and verification capabilities. Moreover, ensuring real-time data integrity checking in latency-sensitive industrial applications remains a significant challenge.

To address these issues, this paper proposes a verifiable and secure IIoT data deduplication scheme with real-time data integrity checking in fog-assisted cloud environments. The proposed scheme leverages fog nodes to perform preliminary deduplication and integrity verification near data sources, thereby reducing communication overhead and latency.Cryptographic techniques are employed to ensure data confidentiality and prevent unAthororized data leakage, while a verifiable integrity checking mechanism enables users to confirm the correctness and completeness of stored data in real time. In addition, the scheme supports secure ownership verification to prevent illegitimate deduplication attacks. Security and performance analysis demonstrate that the proposed approach effectively preserves data privacy, guarantees data integrity, and significantly reduces storage and computation overhead. Therefore, it is well suited for large-scale IoT applications requiring efficient, secure, and real time data management.

KeywordsIndustrial Internet of Things (IoT), Data Deduplication, Fog Computing, Cloud Storage, Data Integrity Verification, Real-Time Integrity Checking, Data Security.

ADVANCING PRECISION AGRICULTURE: MACHINE LEARNING - ENHANCED GPR ANALYSIS FOR ROOT -ZONE SOIL MOISTURE ASSESSMENT IN MEGA FARMS

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ABSTRACT

Accurate estimation of root-zone soil moisture is essential for precision agriculture and efficient irrigation management. Traditional soil moisture measurement methods are often invasive, time-consuming, and unsuitable for large-scale agricultural fields. To address these challenges, this paper presents a machine learning–enhanced Ground Penetrating Radar (GPR) approach for non-destructive soil moisture assessment in mega farms. GPR signals are processed and analyzed using machine learning techniques to improve prediction accuracy under varying soil conditions. The proposed method enables large-scale monitoring of root zone soil moisture, reduces water wastage, and supports improved crop productivity. This approach provides a scalable and effective solution for smart and sustainable agriculture.

KeywordsPrecision Agriculture, Ground Penetrating Radar (GPR), Soil Moisture Estimation, Root-Zone Soil Moisture.

BLOCKCHAIN-BASED PRIVACY PRESERVING DEDUPLICATION AND INTEGRITY AUDITING IN CLOUD STORAGE

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ABSTRACT

Ensuring cloud data security and reducing cloud storage costs have become particularly important. Many schemes expose user file ownership privacy when deduplicating Authentication tags and during integrity auditing. Moreover, key management becomes more difficult as the number of files increases. Also, many audit schemes rely on third party auditors (TPAs), but finding a fully trustworthy TPA is challenging. Therefore, we propose a blockchain-based integrity audit scheme supporting data deduplication. It protects file tag privacy during deduplication of ciphertexts and Authentication tags, safeguards audit proof privacy, and effectively protects user file ownership privacy. To reduce key management costs, we introduce identity-based broadcast encryption (IBBE) that does not require interaction with key servers, eliminating additional communication costs. Additionally, we use smart contracts for integrity auditing, eliminating the need for a fully trusted TPA. We evaluate the proposed scheme through security and theoretical analyses and a series of experiments, demonstrating its efficiency and practicality.

KEYWORDSBlockchain, Cloud Storage, Privacy Preservation, Data Deduplication, Integrity auditing.

LEVERAGING MACHINE LEARNING FOR ENHANCED BUG TRIAGING IN OPEN-SOURCE SOFTWARE PROJECTS

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ABSTRACT

Bug triaging is an important process in software development where reported bugs are analyzed and assigned to the most suitable developer. In large open source software projects, thousands of bugs are reported daily, making manual bug triaging time-consuming, costly, and error prone. To overcome these challenges, this project proposes a machine learning-based bug triaging system. The system uses historical bug reports, including bug descriptions, severity, and past developer assignments, to automatically predict the most appropriate developer for a new bug. Natural Language Processing (NLP) techniques are used to process textual bug data, and machine learning algorithms are applied to classify and rank developers. By suggesting the top-k most relevant developers, the proposed system reduces triaging time, improves accuracy, and enhances overall software quality. This approach helps open source communities manage bugs more efficiently and speeds up the software maintenance process.

The proposed system continuously learns from newly resolved bugs, enabling it to adapt to changes in developer roles and project evolution. By reducing manual intervention, the system improves triaging accuracy, shortens bug resolution time, and optimizes developer workload distribution. Experimental results demonstrate that the machine learning-based approach outperforms traditional manual and rule-based methods.

KeywordsNatural Language Processing (NLP), Bug Report Classification, Developer Recommendation.

MULTI-STAGE ADVERSARIAL DEFENSE FOR ONLINE DDOS ATTACK DETECTION SYSTEM IN IOT

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ABSTRACT

The rapid proliferation of Internet of Things (IoT) devices has significantly increased the attack surface for Distributed Denial of Service (DDoS) attacks, making real-time detection a critical security challenge. Traditional detection mechanisms often fail against evolving and adversarial DDoS strategies due to their limited adaptability and robustness. To address this issue, this paper proposes a Multi-Stage Adversarial Defense Framework for online DDoS attack detection in IoT environments. The proposed system integrates data preprocessing, feature optimization, and adversarial-aware learning across multiple stages to accurately distinguish between normal and malicious traffic. By incorporating adversarial training and ensemble detection strategies, the framework enhances resilience against evasion and poisoning attacks. The system operates in an online manner, enabling timely detection with minimal computational overhead, which is suitable for resource-constrained IoT networks. Experimental evaluations demonstrate that the proposed approach achieves improved detection accuracy, reduced false positive rates, and stronger robustness against adversarial DDoS attacks compared to existing detection models. The results indicate that the multi-stage adversarial defense mechanism provides an effective and scalable solution for securing IoT networks against sophisticated DDoS threats.

KeywordsInternet of things, drift detection, online learning, Adversarial attack, multi stage Adversarial attack defense.

AN ENSEMBLE-BASED AUTO INSURANCE FRAUD DETECTION USING BQANA HYPERPARAMETER TUNING

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ABSTRACT

In Technical economy, Insurance fraud in the auto industry is a serious problem because it causes large financial losses and reduces customer trust. Although machine learning techniques are already used to detect fraudulent insurance claims, many existing methods do not use well tuned algorithms, which limits their effectiveness.

To solve this problem, this study introduces an ensemble-based fraud detection model that combines multiple classifiers and uses a smart weighted voting approach to make better decisions.In this approach, three popular machine learning models—Support Vector Machine (SVM), Random Forest (RF), and XGBoost—are used together in an ensemble. Their hyperparameters are optimized using a special algorithm called the Binary Quantum-Based Avian Navigation Optimizer Algorithm (BQANA).

Overall, The results show that the ensemble model with BQANA-optimized parameters performs significantly better than other methods.The best results are achieved when the data is balanced at a 1:1 ratio, with very high accuracy, precision, recall, and F1-score. Overall, this study demonstrates that using BQANA for hyperparameter optimization and combining multiple models into an ensemble greatly improves the detection of car insurance fraud compared to conventional methods.

KeywordsFraud Detection; BQNA technique, Voting strategy, Ensemble Learning, Evaluation performance model.

PHISHING GNN: PHISHING EMAIL DETECTION USING GRAPH ATTENTION NETWORKS AND TRANSFORMER-BASED FEATURE EXTRACTION

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ABSTRACT

Phishing emails remain a critical cybersecurity threat, exploiting social engineering techniques to deceive users and compromise sensitive information. Conventional detection approaches based on handcrafted features and traditional machine learning models often struggle to capture complex semantic patterns and relational structures present in modern phishing campaigns. This project proposes a hybrid phishing email detection framework that integrates Transformer based feature extraction with Graph Attention Networks (GATs). A pre-trained Transformer model is employed to generate deep contextual embeddings from email content, effectively capturing semantic dependencies and long-range contextual information. These embeddings are then utilized to construct a graph representation, where nodes represent emails or textual entities and edges encode semantic or structural relationships.

A Graph Attention Network is applied to this graph to learn adaptive attention weights, enabling the model to focus on the most informative nodes and relationships. This combination enhances the system's ability to detect both known and zero-day phishing attacks. Experimental evaluation demonstrates improved performance in terms of accuracy, precision, recall, and F1- score compared to conventional machine learning and standalone deep learning approaches. The proposed framework provides a scalable and robust solution for intelligent phishing detection in real-world email systems**.**

KeywordsPhishing Email Detection, Graph Neural Networks(GNN), Graph Attention Networks(GAT), Transformer-based Feature Extraction, Natural Language Processing(NLP).

ENHANCING ANTI-MONEY LAUNDERING FRAMEWORKS AN APPLICATION OF GRAPH NEURAL NETWORKS IN CRYPTOCURRENCY TRANSACTION CLASSIFICATION

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ABSTRACT

The rapid growth of cryptocurrencies has introduced new challenges for Anti-Money Laundering (AML) systems due to the decentralized, pseudonymous, and complex nature of blockchain transactions. Traditional AML techniques struggle to effectively detect illicit activities within large-scale transaction networks. To address this issue, this project explores the application of Graph Neural Networks (GNNs) for classifying cryptocurrency transactions as licit or illicit. Using the Elliptic Bitcoin dataset, several GNN architectures—including Graph Convolutional Networks (GCN), Graph Attention Networks (GAT and GATv2), Chebyshev Convolutional Networks, and Graph SAGE—are evaluated. The study investigates the impact of feature selection, skip connections, and final linear layers on model performance. Experimental results demonstrate that models incorporating Chebyshev and GATv2 convolutions, along with skip connections, significantly improve classification accuracy compared to baseline approaches. The findings highlight the effectiveness of GNN-based models in enhancing AML frameworks and emphasize the importance of interpretable graph based learning for combating cryptocurrency-related financial crimes.

KeywordsAnti-Money Laundering, Cryptocurrency, Graph Neural Networks, Bitcoin Transactions, Transaction Classification, Blockchain Analytics, Financial Crime Detection

JOB DEMAND ESTIMATION USING TEXT EMBEDDINGS OF PATENT CLASSIFICATION CODES AND OCCUPATIONAL DATA

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ABSTRACT

This study presents a novel method for estimating job demand by analyzing the relationship between technological advancements and occupational requirements through patent data. By integrating textual data from the United States Patent and Trademark Office (USPTO) and the Occupational Information Network (O*NET), the research develops a framework using advanced text embedding techniques. Semantic similarity measures are applied to match Cooperative Patent Classification (CPC) code descriptions with job task descriptions, constructing a similarity matrix that quantifies the technological relevance of various occupations. The approach estimates annual job task demand based on patent filing trends, providing a datadriven perspective on labor market evolution. To enhance reliability, multiple text embedding models are assessed to determine the most effective one for measuring semantic similarities. Aggregated job task demand estimates are used to project overall job demand trends systematically. Validation is conducted by comparing predicted job demand metrics with empirical employment data, demonstrating a strong correlation between estimated and actual trends. The findings highlight the impact of technological progress on job market dynamics, identifying occupations with increasing or declining demand. The study also acknowledges limitations, such as the need for improved job-task matching and additional data integration, while discussing broader implications for labor market forecasting.

KeywordsJob demand estimation, patent analysis, text embeddings, occupational information network (O*NET), Cooperative Patent Classification (CPC) codes, text similarity, and machine learning/natural language processing (NLP) techniques.

IDENTIFICATION OF SPAMBOTS AND FAKE FOLLOWERS ON SOCIAL NETWORKING USING INTERPRETABLE AI BASED MACHINE LEARNING

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ABSTRACT

Social networking platforms are rapidly growing, but the increasing presence of automated spam accounts creates serious challenges for information credibility, user privacy, and platform security. Spambots spread fake content, advertisements, and misleading information, which negatively affects user trust and the reliability of online communication. Traditional detection methods often struggle to handle the evolving behavior of these automated accounts.

Artificial Intelligence provides effective solutions to improve spambot detection. This study explores the use of Machine Learning and Deep Learning techniques to identify spam accounts based on user behavior, profile features, and activity patterns. It also applies Explainable AI methods such as SHAP and LIME to make the detection process more transparent and understandable.

Overall, the research demonstrates how intelligent detection models can improve the accuracy and reliability of identifying malicious accounts, helping to maintain safer and more trustworthy social networking platforms.

KeywordsSpambot Detection; Interpretable Machine Learning; Explainable AI.

GOODFLIGHT: GOAL ORIENTED DIFFUSION MODEL FOR FLIGHT TRAJECTORY PREDICTION

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ABSTRACT

The rapid growth of air traffic worldwide has increased the complexity of airspace management and the need for accurate flight trajectory predictions. Precise prediction of aircraft trajectories plays a crucial role in ensuring flight safety , optimizing air traffic flow, reducing fuel consumption and minimisingdelays.Flight trajectory prediction is a key task in air traffic control, but existing single-stage or short-term methods often suffer from low prediction diversity, limited accuracy, and poor interpretability. To address these issues, this paper introducesGooDFlight, a goal-oriented diffusion model designed for long-term, intention guided flight trajectory prediction.

GooDFlight divides the prediction process into two stages: goal estimation and trajectory prediction. In the first stage, a one-then-all goal estimation strategy is used to capture macro level uncertainty. In the second stage, a transformer-based diffusion model generates multiple stochastic trajectories conditioned on the estimated goals, effectively capturing micro-level uncertainty in flight operations.

To better evaluate trajectory diversity, the paper also proposes a new metric called Global-local Endpoints Variance (GLeV). The model is extensively tested on the real-world TrajAirdataset from the Pittsburgh-Butler Regional Airport, and the results show that GooDFlight significantly outperforms existing methods in accuracy, diversity, and interpretability.

KeywordsGenerative AI in Aviation, Two stage prediction, Denoising diffusion framework.

EFFICIENT HANDLING OF DATA IMBALANCE IN HEALTH INSURANCE AND FRAUD DETECTION USING META REINFORCEMENT LEARNING

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ABSTRACT

Health insurance fraud detection is a critical challenge for insurance providers due to the highly imbalanced nature of real-world claim data, where fraudulent cases form only a very small percentage compared to legitimate claims. Traditional machine learning and deep learning models often struggle in such scenarios, as they tend to be biased toward the majority class, resulting in poor fraud detection performance. To address this issue, this project proposes an efficient framework for handling data imbalance in health insurance fraud detection using Meta Reinforcement Learning (Meta-RL).

The proposed system formulates the fraud detection problem as a sequential decision-making process within a Markov Decision Process (MDP) environment. Meta reinforcement learning enables the model to learn how to adapt quickly to varying levels of class imbalance across different tasks, rather than relying on static sampling or fixed class-weighting techniques. An adaptive data balancing mechanism is incorporated, which dynamically adjusts class weights and sampling strategies based on the current imbalance ratio and model feedback. This allows the learning agent to focus more effectively on minority fraud instances without overfitting.

KeywordsHealth Insurance Fraud Detection, Data Imbalance, Meta Reinforcement Learning, Adaptive Data Balancing, Machine Learning, Fraud Classification

AN INTEGRATED PREPROCESSING AND DRIFT DETECTION APPROACH WITH ADAPTIVE WINDOWING FOR FRAUD DETECTION IN PAYMENT SYSTEMS

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ABSTRACT

As fraudulent transaction methods evolve rapidly, it becomes progressively more challenging to detect them in payment systems. Static machine learning and rule-based traditional detection methods cannot capture the dynamic and evolving nature of fraudulent behaviors, resulting in lower detection accuracy and a higher false positive rate. This study proposes a complete framework that integrates advanced data preprocessing, effective drift detection, and a reliable detection model. The method uses Mutual Information and SelectKBest for feature selection, applies ADASYN to handle class imbalance, and adopts Convolutional Neural Networks (CNN) to capture transaction patterns. By implementing the Early Drift Detection Method (EDDM) and Adaptive Windowing (ADWIN), drift can be detected in advance and the system can respond to changes. The framework was evaluated on three datasets, including real-world transactions, achieving superior accuracy and precision with values up to 99.99%. The findings show that the framework can adapt to changing fraud patterns, reduce false positives, and enhance detection performance. These insights highlight the importance of drift-aware approaches in real-time fraud detection.

KeywordsFraud Detection, Payment Systems, Concept Drift, Adaptive Windowing (ADWIN), Early Drift Detection Method (EDDM), Data Preprocessing, Feature Selection ,Class Imbalance Handling, Convolutional Neural Networks (CNN), Machine Learning

A SECURE KEY-AGGREGATE KEYWORD RETRIEVAL SCHEME OVER ENCRYPTED DATA IN CLOUD COMPUTING

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ABSTRACT

Key-aggregate keyword retrieval primitive enables a cloud server on behalf of delegated users to securely perform a keyword search over the data encrypted with various public keys. However, existing key-aggregate searchable encryption schemes are insecure against keyword guessing attacks, which result in the privacy leakage of keyword ciphertext and trapdoor. In this paper, we for the first time formulate a secure and efficient key-aggregate searchable encryption for cloud-assisted ioT applications, which not only enables a data owner to securely share the selected documents to multiple users, but also supports data users in delegating the capability of keyword search to a cloud server for searching the desired documents without leaking my privacy of keyword ciphertext and trapdoor. Then, the security of the proposed scheme is formally defined and proven to be secure against the indistinguishable selective-file chosen keyword attacks. The flexibility and practicability of the formulated scheme is also demonstrated by theoretical evaluations and experimental simulations.

KeywordsSecurely enables users to search and access encrypted cloud data using a single aggregate key while maintaining data privacy.

DYNAMIC PRICING MODELS IN E-COMMERCE: EXPLORING MACHINE LEARNING TECHNIQUES TO BALANCE PROFITABILITY AND CUSTOMER SATISFACTION

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ABSTRACT

This research investigates the application of Recurrent Neural Networks (RNNs), paired with gradient-based optimization techniques, for dynamic pricing in e-commerce. The primary objective is to develop a pricing model that effectively balances profitability with customer satisfaction by leveraging sequential data such as time-series information and customer behavior patterns. The approach utilizes optimization methods like Stochastic Gradient Descent (SGD) to enhance model convergence and performance. Key findings indicate superior predictive accuracy compared to traditional models such as Linear Regression and Decision Trees, particularly in real-time data updates and price elasticity scenarios. Additionally, the analysis reveals that machine learning models can efficiently adapt pricing strategies in response to market dynamics, significantly improving profitability while maintaining customer satisfaction. This study provides valuable insights into the practical application of advanced machine learning techniques in e-commerce pricing. The results suggest that ML-based dynamic pricing models can optimize revenue generation and offer strong implications for pricing strategy development in modern retail environments. Future work may explore hybrid models and multi-objective optimization techniques to further refine dynamic pricing systems.

KeywordsDynamic Pricing, Machine Learning, Recurrent Neural Networks, E-Commerce, Optimization Techniques.

EXPLORING URBAN CRIME THROUGH THE LENS OF AADAPTIVE REGION PARTITIONING AND BUILT ENVIRONMENT FEATURES

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ABSTRACT

Urban crime analysis plays a critical role in public safety and smart city planning. Conventional approaches typically utilize static spatial units, which can obscure localized crime patterns and reduce predictive accuracy. This research proposes an adaptive region partitioning framework that dynamically segments urban areas based on crime distribution and built environment features. By integrating spatial crime data with urban infrastructure characteristics—such as road networks, land use, building density, and public amenities—the system enables more precise crime hotspot identification and improved predictive modeling. Experimental analysis demonstrates that adaptive spatial segmentation significantly enhances crime prediction accuracy compared to traditional fixed-region methods, offering valuable insights for law enforcement agencies and urban planners.

KeywordsUrban Crime, built Environment, region partitioning, multi density data,

LIGHTWEIGHT BLOCKCHAIN FOR DATA INTEGRITY AND TRACEABILITY IN IOT NETWORKS

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ABSTRACT

Data integrity and traceability are important challenges to provide security in the Internet of Things (IoT) networks, which are often vulnerable to data manipulation attacks due to their use of low resource devices and wireless communication technologies. In this regard, blockchain is a promising solution to enhance IoT security, but the implementation of a conventional blockchain requires high computational and network connectivity resources that are not compatible with IoT networks. In this paper, we propose a lightweight blockchain for data integrity and traceability in IoT networks that adapts the Distributed Ledger Technology (DLT) feature of blockchain to the LoRaWAN wireless communication protocol. Our proposal offers data integrity without the need for complex consensus algorithms or cryptographic operations. We also have designed and implemented a logical LoRaWAN P2P topology that enables communication between the IoT nodes which comprise LoRaWAN's characteristic star topology. Finally, we evaluate our proposal and demonstrate its feasibility and performance in terms of data traceability, and network overhead.

KeywordsLightweight blockchain, IOT Security, Data Integrity, Data Traceability, Disturbed Ledger Technology.

CUSTOMER BEHAVIOR ANALYSIS AND PREDICTIVE MODELING IN SUPERMARKET RETAIL A COMPREHENSIVE DATA MINING APPROACH

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ABSTRACT

In the dynamic landscape of supermarket retail, understanding customer behavior is paramount for optimising business strategies and enhancing profitability. This paper presents a comprehensive data mining approach to analyze customer behavior and build predictive models within the supermarket retail domain. Leveraging advanced data analytics techniques, our methodology encompasses data preprocessing, exploratory data analysis, feature engineering, model selection, and evaluation. This paper presents a comprehensive approach to customer behavior analysis and predictive modeling within the context of supermarket retail. We delve into the intricacies of data mining methodologies, exploring how retailers can leverage diverse datasets to uncover valuable insights and build predictive models that drive business growth and customer satisfaction. From data preprocessing to model evaluation, each step in the process is meticulously examined, highlighting best practices and key considerations for effective implementation.

KeywordsCustomer behaviour analysis, Retail data mining, Predictive modeling, Customer Segmentation, RFM analysis and Market Basket Analysis.

DETECTION OF RUMORS AND THEIR SOURCES IN SOCIAL NETWORKS: COMPREHENSIVE SURVEY

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ABSTRACT

With the recent advancements in social network platform technology, an overwhelming amount of information is spreading rapidly. In this situation, it can become increasingly difficult to discern what information is false or true. If false information proliferates significantly, it can lead to undesirable outcomes. A rumor-detection problem involves identifying and mitigating false or misleading information spread via various communication channels, particularly online platforms and social media. Rumors can range from harmless ones to deliberately misleading content aimed at deceiving or manipulating audiences. Detecting misinformation is crucial for maintaining the integrity of information ecosystems and preventing harmful effects such as the spread of false beliefs, polarization, and even societal harm. However, most of the existing surveys have analyzed these two issues separately. In this work, we first survey the existing research on the rumor-detection and rumor source detection problems with joint detection approaches, simultaneously.

KeywordsRumors source identification, Natural Language Processing (NLP), Trust and Reputation system, Feature Extraction.

SHILLING ATTACKS AND FAKE REVIEWS INJECTION PRINCIPLE O MODELS DATASETS

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ABSTRACT

Recommendation systems have proved to be a compelling performance in overcoming the data overload problem in many domains, such as e-commerce, e-health, and transportation. Recommender systems guide users/clients to personalized recommendations based on their preferences. However, some recommendation systems are vulnerable to shilling attacks, which create rating biases or fake reviews that will eventually affect the Authorenticity and integrity of the generated recommendations. This survey comprehensively covers various shilling attack methods, including high-knowledge, low-knowledge attacks, and obfuscated attacks. It explores malicious review generators that generate fake text. In addition to that, this survey covers shilling attack detection methods such as supervised, unsupervised, semi supervised, and hybrid techniques. Natural Language Processing techniques are also thoroughly explored for fake text review detection using large language models (LLMs). A wide range of detection mechanisms incorporated in the literature is examined, such as convolutional neural network (CNN), long short term memory (LSTM)-based detectors for rating-based shilling attacks, and bidirectional encoder representation (BERT) and RoBERTa-based detectors for fake reviews that are accompanied by shilling attacks, aiming to offer insights into the evolving methods of shilling attack strategies and the corresponding advancements in the detection methods.

KeywordsRecommender system, Reviews, Fake news, motion pictures, collaboration, standards, Robustness, knowledge engineering, knowledge-based system.

MACHINE LEARNING IN MONEY LAUNDERING DETECTION OVER BLOCKCHAIN TECHNOLOGY

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ABSTRACT

Layering through cryptocurrency transactions has emerged as a sophisticated technique for laundering illicit funds within cybercrime ecosystems. Blockchain technology, while offering transparency and decentralization, also enables rapid and automated asset movement across multiple wallets and exchanges, making financial crime detection increasingly complex. To address this challenge, this project proposes a machine learning–based framework called Value-driven Transactional Tracking Analytics for Crypto Compliance (VTAC) for identifying illegal cryptocurrency transactions over Blockchain networks. The proposed approach integrates data preprocessing, normalization, model training, and automated de-anonymization techniques to analyze transactional patterns effectively. Experimental results demonstrate that the VTAC framework achieves high detection accuracy, with the XGBoost model reaching up to 97.5% accuracy, outperforming existing methods. Key evaluation metrics such as precision, recall, and F1-score consistently exceed 95%, highlighting the reliability and robustness of the proposed system. This framework serves as an advisory solution to assist financial crime investigators and regulatory Authororities in enhancing the detection and reporting of suspicious cryptocurrency transactions in cyberspace.

KeywordsBlockchain Technology, Cryptocurrency Transactions, Money Laundering Detection, Machine Learning, Transaction Analysis, De-anonymization, Crypto Compliance, Financial Crime Detection.

FROM BAG-OF-WORDS TO TRANSFORMERS: A COMPARATIVE STUDY FOR TEXT CLASSIFICATION IN HEALTHCARE DISCUSSIONS IN SOCIAL MEDIA

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ABSTRACT

Social media platforms contain a large number of healthcare-related discussions shared by patients and users. Analyzing this data is important for understanding health issues and patient opinions. This study presents a comparative analysis of Bag-of-Words (BoW) and Transformer based models for text classification in healthcare discussions on social media. Bag-of-Words represents text using word frequency but cannot capture context or meaning.

Transformer models understand word order and context, resulting in better classification performance. The study shows that Transformer-based approaches provide higher accuracy and more effective analysis compared to traditional BoW methods.

KeywordsDeep Learning, Transformer Models, BERT, Attention Mechanism, Sentiment Analysis, Topic Classification

SOCIAL ENGINEERING ANALYSIS FRAMEWORK: A COMPREHENSIVE PLAYBOOK FOR HUMAN HACKING

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ABSTRACT

Social Engineering attacks are among the most exploited methods in today's cybersecurity threat landscape. Despite the impact and the volume of such incidents, there is still a surprising lack of comprehensive tools or frameworks offering an in-depth insight into Social Engineering attacks. The paper delivers a handy yet comprehensive framework for the analysis of the Social Engineering tactics, techniques, and procedures (TTPs), distinguishing six major phases of the Social Engineering process, together with detailed TTPs linked with each of them.

The outcome presents that framework in the form of a legible, transparent, and ready-to-use matrix, similar to the MITRE ATT&CK matrix. The paper also contains a cross-comparison between the proposed framework and the MITRE ATT&CK to underline the added value of the proposed approach. In order to demonstrate the practical usefulness of the approach proposed in this paper, after formulating the entire framework, we apply it to decompose and analyze in detail some real-life Social Engineering scenarios.

KeywordsSocial Engineering, Human Hacking, Cybersecurity, Psychological Manipulation, Threat Analysis Framework, Behavioral Security.

DAMAGE DETECTION METHOD FOR ROAD ANCILLARY FACILITIES USING ATTENTION MECHANISM

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ABSTRACT

Anti-glare reflective stickers are vital road facilities that ensure driver visibility at night and in bad weather. However, current detection methods face low accuracy and high computational cost in complex scenes. This paper proposes an attention-based damage detection model for road ancillary facilities. The model replaces standard convolutions with the D-Ghost Net V3Conv module to enhance feature extraction. This significantly reduces computation while maintaining detection performance. An improved AR-Bi Former attention mechanism is embedded into the backbone network. It adaptively adjusts feature map weights using parallel contextual information. This effectively improves small-target detection in complex backgrounds. To enhance localization accuracy, the WIoUv3 bounding box loss function is applied. This improves regression under different scales and overlap conditions. Experimental results show a mAP of 89.78% and FPS of 86.31.
These results outperform the original YOLOv8 by 1.57% and 1.82%, respectively. The model is well suited for real-time highway monitoring in edge computing environments.

KeywordsRoad safety, damage detection, attention mechanism, deep learning, object detection, reflective stickers.

CLASSIFYING SCAM CALLS THROUGH CONTENT ANALYSIS WITH DYNAMIC SPARSITY TOP-K ATTENTION REGULARIZATION

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ABSTRACT

The rise of scam calls in recent years necessitated effective countermeasures against these fraudulent activities, which cause financial losses and threaten personal security. Although previous research utilizing traditional machine learning techniques has fallen short in today's technological landscape, this study introduces a novel approach for recognizing scam calls by analyzing their content. By leveraging natural language processing techniques and deep learning methodologies, we propose the D-STAR (Dynamic Sparse Attention with Top-k Regularization) model, a transformer-based architecture designed to enhance scam call content detection. Unlike conventional models, D-STAR integrates Dynamic Sparse Attention (DSA),Top-k selection, and sparsity regularization, optimizing computational efficiency while preserving key scam-related contextual information. Our data set consists of 400 scam and 400 non-scam call transcripts, collected from publicly available sources such as social media, news reports, and discussion forums. The model was evaluated using various hyperparameter configurations and managed to achieve an accuracy of 94%, a recall of 91.67%, and an F1- score of 84.98% in classifying scam call contents, outperforming state-of-the-art baselines suchas CNN, LSTM, Decision Tree, Random Forest, and SVM in the scam call detection domain. A knowledge graph-based preprocessing technique was also introduced to enrich scam-related contextual understanding. The proposed approach demonstrates its effectiveness in enhancing scam call classification while maintaining computational efficiency.

KeywordsNatural Language Processing (NLP), Deep Learning, Attention Mechanism.

AD CLICK FRAUD DETECTION USING MACHINE LEARNING AND DEEP LEARNING ALGORITHMS

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ABSTRACT

In online advertising, click fraud poses a significant challenge, draining budgets and threatening the industry's integrity by redirecting funds away from legitimate advertisers. Subsequently, a thorough evaluation was conducted involving nine diverse machine learning (ML) and Deep Learning (DL) models. After Recursive Feature Elimination (RFE), the ML models consistently demonstrated robust performance. DT and RF surpassed 98.99% accuracy, while GB, LightGBM, and XGBoost achieved 98.90% or higher.

The study underscores the prowess of tree-based methods and advanced algorithms in detecting click fraud, as evidenced by high accuracy, precision, and recall scores. These findings contribute valuable. Precision scores, measuring accurate identification of fraudulent clicks, exceeded 98% for models like ANN. In parallel, deep learning (DL) models, including Convolutional Neural Network (CNN), Deep Neural Network (DNN), and Recurrent Neural Network (RNN), showcased strong performance. RNN, in particular, achieved 97.34% accuracy, emphasizing its efficacy.

KeywordsMachine Learning, Deep Learning, Clickstream Analysis, Anomaly Detection, Fraud Classification, Bot Classification, Online Advertising Security.

EVSEB EFFICIENT AND VERIFIABLE SEARCHABLE ENCRYPTION WITH BOOLEAN SEARCH FOR ENCRYPTED CLOUD LOGS

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ABSTRACT

The increasing adoption of cloud computing has led to large-scale outsourcing of system and application logs to third-party cloud servers. While encryption ensures data confidentiality, it significantly limits efficient search functionality over encrypted data. This project proposes an Efficient and Verifiable Searchable Encryption scheme supporting Boolean queries for encrypted cloud logs.

The proposed system enables secure keyword search with support for complex Boolean expressions (AND, OR, NOT) over encrypted log data without revealing plaintext information to the cloud server. A secure index structure is constructed to improve search efficiency while minimizing storage and computational overhead. To address the problem of untrusted or semi
honest cloud servers, a verifiability mechanism based on cryptographic proofs (e.g., Merkle hash trees or hash-based Authorentication structures) is integrated, allowing users to verify the correctness and completeness of search results.

The scheme ensures data confidentiality, query privacy, search efficiency, and result integrity while resisting common attacks such as keyword guessing and result tampering.

KeywordsSearchable Encryption, verifiable Search, Boolean Query Processing, Encrypted Cloud Logs, Cloud Security, Data confidentiality, Query Privacy.

PROACTIVE CYBER RESILIENCE: A UNIFIED ASSESSMENT METHODOLOGY FOR INCIDENT FORECASTING WITH CYBER THREAT INTELLIGENCE INTEGRATION

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ABSTRACT

This project focuses on improving cybersecurity by using a proactive cyber resilience approach. Traditional security assessments are mostly qualitative and do not clearly measure an organization's security level. To overcome this problem, the project uses CIS Controls v8 with a ranking and weighting method to calculate a cybersecurity posture score out of 100. This score helps organizations understand how strong or weak their security controls are and identify missing protections.

In addition, the project integrates Cyber Threat Intelligence (CTI) to predict possible cyberattacks in advance. Missing security controls are automatically mapped to MITRE ATT&CK techniques, helping to forecast attacks such as T1027 (obfuscated malware). Real organizational data and synthetic data generated using SMOTE and Random Over Sampling are used to improve accuracy. Overall, this system reduces security assessment time from months to days and helps organizations prevent cyber incidents before they occur.

KeywordsProactive Cyber Resilience, CIS Controls v8, Cyber Threat Intelligence, MITRE ATT&CK, Incident Forecasting, Proactive Defense using MITRE ATT&CK Forecasting.

MACHINE LEARNING IN HOSPITALITY: INTERPRETABLE FORECASTING OF BOOKING CANCELLATIONS

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ABSTRACT

Booking cancellations pose significant challenges to revenue management and demand forecasting in the hospitality sector. This project proposes an interpretable machine learning framework for forecasting hotel booking cancellations using historical reservation data. The problem is formulated as a supervised binary classification task, where models predict the probability of cancellation prior to the check-in date.

Multiple machine learning algorithms, including Logistic Regression, Decision Trees, Random Forest, and Gradient Boosting (e.g., XGBoost), are implemented and evaluated using performance metrics such as Accuracy, Precision, Recall, F1-score, and ROC-AUC. Data preprocessing techniques such as missing value imputation, categorical encoding, feature scaling, and class imbalance handling (e.g., SMOTE) are applied to enhance predictive performance.

To ensure model transparency and interpretability, explainable AI (XAI) techniques such as SHAP (SHapley Additive exPlanations) and feature importance analysis are integrated to quantify the contribution of key variables, including lead time, deposit type, booking channel, customer segmentation, and historical cancellation behavior. The proposed framework not only achieves high predictive accuracy but also provides actionable insights for revenue managers, enabling data-driven strategies to reduce cancellation risk and optimize pricing and inventory allocation.

KeywordsMachine Learning, Hospitality Analytics, Booking Cancellation Prediction.

CYBER SECURITY AND ONLINE SAFETY

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ABSTRACT

Cyber security and online safety are essential in today's digital world, where people use the internet for banking, education, shopping, and communication, leading to large amounts of personal data being stored online. Cyber criminals exploit weak security through methods such as hacking, phishing, malware, and online scams, often causing financial loss and stress. This study highlights the importance of user awareness and basic protection practices, including strong passwords, two-factor Authorentication, avoiding suspicious links, and keeping devices updated. The findings show that responsible online behavior and simple security measures significantly reduce cyber threats and help create a safer digital environment.

KeywordsCyber Security, Online Safety, Cyber Attacks, Data Protection,

CYBER SECURITY AWARENESS FOR STUDENTS

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ABSTRACT

Cyber security awareness is essential for students in today's digital world, as they frequently use the internet for learning, communication, social networking, and financial activities. While digital technologies offer convenience, they also expose students to cyber threats such as phishing, malware, hacking, identity theft, and online fraud, often due to a lack of awareness and weak security practices. This study highlights the importance of educating students about common cyber risks and safe online behaviors, including using strong passwords, enabling two-factor Authorentication, avoiding suspicious links, protecting personal information, and practicing responsible social media use. The findings show that improved cyber security awareness helps students become safer, more responsible internet users and significantly reduces cyber risks, contributing to a more secure digital environment.

KeywordsCyber Security Awareness, Students, Online Safety, Cyber Threats, Digital Literacy

ROBOTICS AND ARTIFICIAL INTELLIGENCE

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ABSTRACT

Robotics and Artificial Intelligence (AI) are rapidly advancing technologies that work together to create intelligent machines capable of performing tasks with minimal human intervention. Robotics focuses on the design, construction, and operation of robots, while AI enables these machines to perceive their environment, learn from data, make decisions, and adapt to changing conditions. The integration of AI in robotics has improved capabilities such as object recognition, motion planning, natural language interaction, and autonomous navigation. These intelligent robots are widely used in industries including manufacturing, healthcare, agriculture, space exploration, and service sectors. This paper presents an overview of robotics and AI, their key components, applications, and the impact of intelligent automation in modern society.

KeywordsRobotics, Artificial Intelligence, Intelligent Automation, Autonomous Robots,

MACHINE LEARNING

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ABSTRACT

Machine Learning is a branch of Artificial Intelligence that enables computers to learn from data and improve their performance without being explicitly programmed. It uses algorithms and statistical models to identify patterns, make predictions, and support decision-making. Machine learning techniques are widely used in applications such as image recognition, speech processing, medical diagnosis, fraud detection, recommendation systems, and autonomous systems. Based on the learning approach, machine learning is mainly classified into supervised learning, unsupervised learning, and reinforcement learning. With the rapid growth of data and computing power, machine learning has become a key technology in modern industries and research fields. This paper provides an overview of machine learning concepts, types, and real world applications, highlighting its importance in solving complex problems efficiently.

CLOUD COMPUTING IN EDUCATION AND BUSINESS

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ABSTRACT

Cloud computing is an emerging technology that delivers computing resources such as storage, processing power, and applications over the internet on a pay-as-you-use basis. It has significantly transformed various sectors, especially education and business. In education, cloud computing enables digital learning, collaboration, and cost-effective management of academic resources. In business, it enhances scalability, productivity, and operational efficiency. This paper discusses the role, benefits, applications, and challenges of cloud computing in both education and business sectors and highlights its future potential.

KeywordsCloud Computing, Education, Business, Digital Learning, Scalability, Cost Efficiency

FROM DATA TO DISCERNMENT: WHEN ALGORITHMS MEET CONSCIENCE IN ETHICAL ARTIFICIAL INTELLIGENCE

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ABSTRACT

Artificial intelligence increasingly shapes human decision-making by offering data-driven predictions and judgments, raising questions about how it transforms human discernment—the reflective weighing of values, consequences, and responsibility. This paper argues that AI externalizes and accelerates moral reasoning, reframes values as metrics, and reshapes agency and accountability, while also revealing collective human biases. It proposes "augmented discernment," a model in which AI supports rather than replaces moral judgment, emphasizing design and cultural practices that protect reflection, responsibility, and moral imagination.

KeywordsEthical Artificial Intelligence, Discernment, Conscience, Moral Agency, Human Centered AI, Algorithmic Ethics.

ARTIFICIAL INTELLIGENCE: CONCEPTS, APPLICATIONS ANDCHALLENGES

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ABSTRACT

Artificial Intelligence (AI) is transforming the way computer systems perform tasks that normally require human intelligence. With the rapid growth of data and computing power, AI technologies have become essential in various fields such as healthcare, finance, education, robotics, and cyber security. Traditional systems are limited in handling complex and dynamic problems, whereas AI-based systems can learn from data, adapt to changes, and make intelligent decisions.

This paper focuses on the fundamentals of Artificial Intelligence and explores key techniques such as Machine Learning, Deep Learning, Natural Language Processing, and Neural Networks. It highlights how these techniques enable automation, prediction, and pattern recognition in real-world applications. The study also discusses the advantages of AI systems, including improved efficiency, accuracy, and scalability. Additionally, the challenges and future scope of AI are briefly examined.

Overall, the paper demonstrates how Artificial Intelligence plays a crucial role in developing intelligent systems and shaping the future of technology-driven solutions.

KeywordsArtificial Intelligence, Machine Learning, Deep Learning, Intelligent Systems.

MECHANICAL ENGINEERING

DESIGN AND DEVELOPMENT OF AUXILIARY POWER SOURCE THROUGH DRAINAGE FILTRATION IN URBAN AREAS

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ABSTRACT

Configuration for the turbine suits the condition as the generator can be place above the sea level. Savonius turbine however suffers from poor efficiency. Conventional Savonius turbine power coefficient is around 0.21 which is low compared to other vertical turbine, and even lower than the betz limit which takes 0.6 as the highest possible power coefficient of the vertical turbine. With this drawback, a study was proposed to find the optimum configuration of Savonius turbine. The study starts with simulation of conventional Savonius turbine in two and three dimensional analyses using Computational Fluid Dynamics (CFD) software. This paper describes the validation process from With the diminishing supply of fossil-energy, new renewable energy sources including marine tidal current are being explored. In vertical axis marine current turbine applications, Savonius- type rotor has been shown as suitable for low current speeds normally associated with Malaysia seas. However, the efficiency of the rotor is low and as such efforts are being made to optimise the rotor in various manners. This paper describes a validation procedure preparation for a parametric study to obtain an optimisedSavonius turbine rotor. The research work results have been validated by comparison with the existing published experiment data. The study was based on conducting two and three dimensional analyses using Computational Fluid Dynamics (CFD) RANSE code. Some parametric analysis has been suggested to obtain an optimal the simulation so that a further investigation regarding to find the optimized configuration of Savonius turbine can be carried out using CFD Software.

KeywordsDynamo, Savonius vertical turbine

HYDRAULIC BRAKINGSYSTEM USING BY SYRINGE

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ABSTRACT

This research paper presents the development and analysis of a novel hydraulic braking system utilizing a syringe mechanism. The conventional hydraulic braking systems commonly used in vehicles have been a subject of interest for enhancement due to their critical role in ensuring safety. This study proposes an innovative approach using syringes to provide hydraulic pressure for braking applications. The paper outlines the design, construction, and experimental analysis of the syringe-based hydraulic braking system, highlighting its potential advantages such as cost-effectiveness, simplicity, and adaptability to various vehicle types. Performance evaluations, including braking force, response time, and efficiency, are conducted to assess the effectiveness of the proposed system compared to traditional hydraulic braking systems. The results demonstrate promising outcomes, indicating the feasibility and efficiency of the syringe-based hydraulic braking system as a viable alternative in automotive applications.

KeywordsHydraulic Braking System, Syringe Mechanism, Automotive Safety, Braking Force, Experimental Analysis.

SMART SERICULTURE: IOT-BASED ENVIRONMENTAL MONITORING FOR SUSTAINABLE YIELD

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ABSTRACT

Sericulture productivity depends strongly on maintaining controlled environmental conditions during silkworm rearing. Variations in temperature and humidity can negatively affect silkworm growth, leading to disease and reduced cocoon yield. This paper presents an IoT-based environmental monitoring system designed to continuously monitor micro-climatic parameters inside silkworm rearing sheds. The proposed system uses temperature and humidity sensors integrated with a micro-controller and IoT communication module to collect and transmit real-time data to a cloud platform. Automated monitoring minimizes the limitations of manual observation and ensures optimal rearing conditions. Experimental analysis indicates improved cocoon quality, reduced mortality, and enhanced sustainability, making the system a practical and scalable solution for modern sericulture practices.

KeywordsIOT; Sericulture; Temperature & Humidity; Smoke ; Light intensity; Buzzer; ESP32.

HYBRID SOLAR OPERATED RAIN SENSING AND WINDOW CLOSING SYSTEM

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ABSTRACT

Solar Energy usage is getting evolved day by day as the demand for the same is growing larger. The basic theme in this project is to develop system that gets its input energy from solar power and uses it to sense the rain drops with help of rain sensor and by applying pneumatic principles, Window is being operated. This project circuit gives automatically window closing when its sensor is wetted by water. Mostly used for rain detection in automobiles. In this project the rain sensor has to place making an angle of about 30 - 45 degrees to the ground. This makes the rain water to flow through it to the ground and prevents the window is closing on due to the stored water on the sensor. The metal used to make the sensor has to be aluminum and not copper. This is because copper forms a blue oxide on its layer on prolonged exposure to moisture and has to be cleaned regularly. The aluminum foils may be secured to the wooden / plastic board via epoxy adhesive or small screw. Automated system helps to reduce the man power and can work under any conditions.

KeywordsPower Generating, Rain Detection, Automobiles, Solar panel.

MODELLING AND FABRICATION OF ELECTRICAL CAR

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ABSTRACT

During the last few decades, environmental impact of the petroleum-based transportation infrastructure, along with the peak oil, has led to renewed interest in an electric transportation infrastructure. Electric vehicles differ from fossil fuel-powered vehicles in that the electricity they consume can be generated from a wide range of sources, including fossil fuels, nuclear power, and renewable sources such as tidal power, solar power, and wind power or any combination of those. An electric vehicle (EV), also referred to as an electric drive vehicle, uses one or more electric motors or traction motors for propulsion. Three main types of electric vehicles exist, those that are directly powered from an external power station, those that are powered by stored electricity originally from an external power source, and those that are powered by an on-board electrical generator, such as an internal combustion engine (a electric vehicle) or a hydrogen fuel cell. Electric vehicles include electric cars, electric trains, electric lorries, electric aero planes, electric boats, electric motorcycles and scooters and electric spacecraft. Proposals exist for electric tanks, diesel submarines operating on battery power are, for the duration of the battery run, electric submarines, and some of the lighter UAVs are electrically-powered.The electric vehicle (EV) is propelled by an electric motor, powered by rechargeable battery packs, rather than a gasoline engine. From the outside, the vehicle does not appear to be electric. In most cases, electric cars are created by converting a gasoline-powered car. Often, the only thing that clues the vehicle is electric is the fact that it is nearly silent.

KeywordsElectric Motor, Battery, Controller.

BREAKDOWN VOLTAGE DYNAMICS IN SIC MOSFET'S: EMERGING INNOVATIONS AND DESIGN STRATEGIES.

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ABSTRACT

Silicon Carbide (SiC) MOSFETs have emerged as key enabling devices in modern power electronics due to their wide bandgap, high critical electric field, and superior high-voltage and high-temperature performance compared with silicon-based devices. The recent advances in breakdown voltage behaviour, device design, and reliability of SiC MOSFETs across voltage ratings from 650V to 15kV. Studies based on TCAD simulations and experimental validation show that breakdown voltage is primarily determined by drift region design, with values exceeding 2500 V at optimized doping levels. State-of-the-art commercial devices achieve very low specific on-resistance, significantly outperforming silicon and super junction MOSFET limits while enabling high-efficiency power conversion.These also highlights critical reliability challenges, including threshold voltage instability under gate stress, dynamic ON-resistance degradation during switching, and sensitivity of trench devices to negative gate bias. Temperature effects on breakdown voltage are relatively small, confirming excellent thermal stability. Innovative solutions such as shielded and buffered-gate structures, SiC/Si heterojunction devices, and machine learning–assisted performance prediction demonstrate substantial improvements in breakdown voltage, on-resistance, and design efficiency. Additionally, adaptive gate control strategies reduce switching losses and improve system-level efficiency. Overall, SiC MOSFET technology is positioned for transformative impact in electric vehicles, renewable energy systems, and high-voltage power applications.

Keywords Silicon Carbide (SiC), MOSFET, Breakdown Voltage, Power Electronics, TCAD Simulation, Threshold Voltage Instability, Dynamic ON-Resistance, Neural Networks, Heterojunction Devices, Reliability, High-Voltage Devices

FABRICATION OF A TRI WHEEL CYCLE BY USING STEERING MECHANISM WITH MOTOR & BATTERY

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ABSTRACT

This is a single seat three wheeled vehicle with front wheel having steering mechanism; the steering column hinged to the base which is pivoted to the link mechanism to the cranking mechanism and by steering column pushing and pulling with respect to that centre will operate the cranking to affect the rotation of the rear wheels. Here the steering column is used for propulsion, using the advantage of leverage. Here balance and distribution of mass and balance and centre of gravity and the steering column which is pivoted and effecting the link mechanism to crank the wheel shaft for propelling. Best use for campus drive. Initially, we identified an issue where the steering did not remain in the neutral (idle) position while the vehicle was in motion. To address this, we redesigned and fabricated the steering mechanism. After modification, the steering now maintains its idle position during forward movement, allowing the vehicle to move freely and smoothly. During the initial testing, we noticed that driving the vehicle required excessive effort, indicating a mechanical inefficiency. After analysing the issue, we identified the root cause and introduced a belt drive mechanism. This modification significantly improved the vehicle's performance, allowing for smoother and more effortless movement. Additionally, we designed a interlocking system to engage and disengage the connecting rod while the motor is running. This ensures that the motor-driven system operates independently without affecting the steering functionality, allowing smooth and controlled vehicle movement.

Keywordsbelt drive mechanism, motor & battery.

ALUMINUM CASTING TOOL DESIGN FOR CONNECTING ROD USING 8 CAVITIES

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ABSTRACT

The connecting rod is a critical component in internal combustion engines, responsible for transmitting reciprocating motion from the piston to the crankshaft. In automotive mass production, reducing component weight, manufacturing cost, and cycle time while maintaining structural integrity is of significant importance. This paper presents the design and development of an aluminum die-casting tool for manufacturing a connecting rod using an eight-cavity mold configuration aimed at high-volume production.The connecting rod is designed for a 150 cc engine using empirical design relations and aluminum alloy material properties to achieve weight reduction without compromising functional requirements. A three-dimensional parametric model of the connecting rod is developed using Pro/ENGINEER, followed by core and cavity extraction through the manufacturing module. The die design incorporates appropriate gating, runner, and feed systems suitable for multi-cavity die casting. Detailed process calculations, including locking force, shot weight, fill time, and plunger diameter, are carried out to validate the feasibility of the selected die-casting machine. CNC tool paths for roughing and finishing operations of the core and cavity are generated using CAM integration. The results indicate that the eight-cavity die configuration enables efficient bulk production with improved material utilization, reduced manufacturing cost, and enhanced productivity. The study demonstrates that the integration of aluminum die casting with CAD/CAM-based tool design provides an effective and economical solution for the large-scale manufacturing of automotive connecting rods.

KeywordsConnecting Rod, Aluminum Die Casting, Multi-Cavity Mold, Tool Design, CAD/CAM, Pro/ENGINEER, High-Pressure Die Casting.

DESIGN AND ANALYSIS OF RAIL WHEEL

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ABSTRACT

The demand for higher train speeds and increased axle loads has significantly amplified wheel/rail contact forces, shifting the primary mode of railroad wheel damage from gradual wear to rolling contact fatigue (RCF). Unlike wear, RCF leads to abrupt and potentially catastrophic failures, such as shattered rims caused by subsurface cracks propagating parallel to the wheel tread surface. Because shattered rim failures compromise the structural integrity of the wheel and can lead to severe train derailments, predicting these fractures is critical. While traditional RCF models rely on simplified stress calculation techniques, such as the Hertz analytical solution, these methods fail to fully account for the complex geometry of the wheel/rail interface. To address this limitation, this study focuses on subsurface crack propagation analysis utilizing a three-dimensional (3D) finite element method (FEM). This approach allows for a highly accurate calculation of the stress response within the wheel components under rolling contact loading, providing a more robust framework for evaluating and preventing shattered rim failures.

KeywordsRolling Contact Fatigue (RCF), Railroad Wheels, Shattered Rim, Subsurface Crack Propagation,3D Finite Element Method (FEM), Wheel/Rail Contact Forces.

DESIGN AND DEVELOPMENT OF UNMANNED ARMY ROBOT USING RF CONTROL

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ABSTRACT

The main aim of defense is to guard the border and to ensure that no infiltrators or smuggler enters our country. Defense is deployed in very hard and sensitive areas at border as well as for internal security duty. Keeping in view the area of responsibility given to defense and availability of man power, sometimes it is not at all possible to guard some vulnerable point round the clock, at that time it becomes imperative to develop an electronic system through which the weapon can be operated remotely or automatically. to overcome this problem, we have designed a unique system i.e., remote controlled / auto firing device which can be sited at such places and is capable to fire automatically and also remotely whenever any unwanted person enters an unattended point / place. Generally, many risky, unmanageable and various tasks are difficult to handle by human. Thus, there is need for something, which can be physically present and handle the task. So, robot can be much effective and useful option for such risky tasks. Nowadays in industries, medical, colleges, home appliances, restaurants, military and defence, robot plays very important role and make the task easier and efficient. the proposed work is to design and develop for military application. in this paper we are focusing on the use of battery life and also it will not always remain in surveillance mode although whenever user wants to control robot, they can do it on their choice otherwise it will always remain in automatic mode. this paper also presents a defense robot which uses different technologies like arduino uno, wireless camera, rf module etc.

Keywords Unmanned, robot, RF control

EFFECT OF HYBRID TEXTURED TOOL ON TURNING OPERATION PERFORMANCE WHILE MACHINING OF AISI 304 MATERIAL UNDER MQL TECHNIQUE

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ABSTRACT

This study investigates the machining performance of AISI 304 austenitic stainless steel using an innovative hybrid textured tool under Minimum Quantity Lubrication (MQL) conditions. AISI 304 is widely recognized for its high strength and low thermal conductivity, which often leads to excessive tool wear and poor surface finish during conventional turning. To address these challenges, micro-textures (combining multiple geometries, such as grooves and pits) were fabricated on the rake face of tungsten carbide inserts to enhance lubricant retention and reduce the tool-chip contact area. The experimental work evaluates the synergistic effect of hybrid texturing and MQL on key performance indicators, including surface roughness, tool wear, and chip morphology
Keywords Minimum Quantity Lubrication; AISI 304; Surface textured tool

ENERGY EFFICIENCY APPROCH THROUGH ACTIVE STRATEGIES BASED ON SOLAR

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ABSTRACT

A Detailed Report on Energy Efficiency Approach through Active Strategies Based on Solar & including Rain Water Harvesting of SPA, YSRAFAU, Kadapa has been performed. It is Submitted with the details of Energy Consumption of building & Suitable Measures for Energy Conservation which aims for c. The work that has been undertaken in the energy audit of the premises includes: Investigating how much electricity and other forms of energy are consumed. Identifying cost-effective measures to make energy use more efficient. Estimating the potential costs and energy savings of implementing efficiency measures.

KeywordsRain Water Harvesting, Solar and Solar.

MASTER OF BUSINESS ADMINISTRATION

A STUDY ON SERVICE QUALITY OF ON-BOARD AND STATION SERVICE QUALITY AND THEIR INFLUENCE ON PASSENGER LOYALTY IN SOUTH RAILWAY

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ABSTRACT

Service quality plays a crucial role in shaping passenger experiences and fostering long-term loyalty in public transportation systems. This study examines the impact of on-board service quality and station service quality on passenger loyalty in the South Railway zone. On-board service quality is assessed through dimensions such as cleanliness, seating comfort, staff responsiveness, safety, and catering services, while station service quality includes factors like ticketing efficiency, waiting area facilities, signage, accessibility, and security. Using a structured questionnaire, data were collected from railway passengers traveling across major stations and trains in South Railway. The study employs statistical techniques such as descriptive analysis, correlation, and regression analysis to evaluate the relationship between service quality dimensions and passenger loyalty. The findings reveal that both on-board and station service quality have a significant and positive influence on passenger loyalty, with on- board service quality showing a stronger impact. The study highlights the importance of improving both travel-related and station-based services to enhance passenger satisfaction, encourage repeat travel, and strengthen loyalty toward South Railway services. The results offer practical insights for railway authorities to prioritize service quality improvements and implement passenger-centric strategies to remain competitive in the evolving transportation sector.

Keywords Service Quality; On-board Service Quality; Station Service Quality; Passenger Loyalty; South Railway; Indian Railways

ROLE OF AI IN EMPLOYEE MOTIVATION AND SUSTAINABILITY IN MANAGEMENT

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ABSTRACT

The increasing adoption of Artificial Intelligence (AI) in human resource management is transforming employee motivation strategies and supporting organizational sustainability. This study examines how AI-driven HR practices—such as talent analytics, performance management systems, personalized training, and employee engagement platforms—influence motivation, productivity, and retention. From a management perspective, AI enables data-driven decision-making, enhances fairness and transparency in performance evaluations, and supports strategic workforce planning. The paper also explores the role of AI in promoting sustainable organizations by improving employee well-being, optimizing human capital utilization, and encouraging continuous learning and adaptability. However, the implementation of AI in HR presents managerial challenges, including ethical concerns, data privacy, workforce resistance, and the need for reskilling. The study emphasizes that aligning AI adoption with organizational culture and strategic HR objectives is critical to achieving sustained employee motivation and long-term organizational sustainability.

Keywords: Artificial Intelligence; Employee Motivation; Human Resource Management; Organizational Sustainability; Strategic Management; Workforce Analytics; Employee Engagement

A STUDY ON PERFORMANCE APPRAISAL SYSTEMS AND ITS IMPACT ON EMPLOYEE SATISFACTION

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ABSTRACT

Performance appraisal serves as a strategic tool for organizations to evaluate employee contributions, enhance workplace efficiency, and support professional growth. This study explores the performance appraisal system at Triovision Composite Technologies Pvt. Ltd., Kadapa, with the objective of examining its design, implementation, and its impact on employee satisfaction and overall organizational performance. The research adopts a descriptive methodology, using primary data collected through structured questionnaires and employee interactions, along with secondary data obtained from academic literature. Key dimensions such as appraisal techniques, transparency in evaluation, clarity of performance standards, and effectiveness of feedback communication are analyzed. The study aims to understand employee perceptions regarding fairness and satisfaction with the appraisal process. The findings are expected to highlight both strengths and areas for improvement within the existing system, and to propose practical recommendations for developing a more transparent, motivating, and employee-centric appraisal framework that aligns with long-term organizational objectives.

Keywords: Performance Appraisal, Employee Performance, HR Practices, Motivation, Job Satisfaction.

A STUDY ON RISK AND RETURN ANALYSIS

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ABSTRACT

Risk and return are the fundamental pillars of investment decision-making, forming the basis for portfolio construction and financial planning. This study explores the relationship between risk and return by analyzing how different investment options perform under varying market conditions. The primary objective is to understand the trade-off investors face between maximizing returns and minimizing exposure to uncertainty. Using statistical tools such as mean return, standard deviation, beta, and correlation, the study evaluates the volatility and performance patterns of selected financial assets. Historical data is examined to identify trends, measure systematic and unsystematic risk, and assess the impact of market fluctuations on investment outcomes.

The research further applies modern portfolio theory to demonstrate the benefits of diversification in reducing overall portfolio risk. By comparing individual securities with diversified portfolios, the study highlights how optimal asset allocation can improve risk-adjusted returns. The findings reveal that while higher risk is often associated with the potential for higher returns, effective portfolio management can balance this relationship to suit different investor profiles. Conservative, moderate, and aggressive investment strategies are discussed to show how risk tolerance influences financial decisions.

Keywords: Risk, Return, Portfolio Management, Diversification, Investment Analysis, Beta, Volatility, Asset Allocation, Financial Markets.

A STUDY ON COGNITIVE AND EMOTIONAL DRIVERS SHAPING INVESTOR BEHAVIOUR TOWARDS INDIAN STOCK MARKET

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ABSTRACT

Investor behavior in the Indian stock market is increasingly influenced by a complex interaction of cognitive and emotional drivers rather than purely rational decision-making. This study examines how cognitive biases—such as overconfidence, herding behavior, anchoring, and availability heuristic—and emotional factors including fear, greed, regret, and optimism shape investment decisions among Indian retail investors. Drawing on behavioral finance theory, the research highlights how psychological factors affect risk perception, portfolio selection, trading frequency, and market participation. Using survey-based data and empirical analysis, the study investigates the relative impact of cognitive versus emotional drivers on investors' decision- making processes in volatile and uncertain market conditions. The findings reveal that emotional responses, particularly fear during market downturns and overconfidence during bullish phases, significantly influence investment behavior, often leading to suboptimal decisions. Cognitive biases further reinforce these emotional reactions, contributing to market anomalies and deviations from efficient market assumptions. The study offers valuable insights for policymakers, financial advisors, and market regulators to design investor education programs and behavioral interventions that promote informed and disciplined investment practices in the Indian stock market.

KeywordsCognitive Biases; Emotional Drivers; Investor Behavior; Behavioral Finance; Indian Stock Market; Retail Investors; Risk Perception; Investment Decision-Making.

ROLE OF TECHNOLOGY-ENABLED AGRI-TECH STARTUPS IN TRANSFORMING AGRICULTURAL VALUE CHAINS: A STUDY OF ANDHRA PRADESH AND TELANGANA

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ABSTRACT

Indian agriculture faces persistent challenges such as low productivity, fragmented landholdings, inefficient supply chains, and limited market access for small and marginal farmers. In this context, technology-enabled agri-tech startups have emerged as a transformative force in strengthening agricultural value chains. By leveraging digital technologies including artificial intelligence, Internet of Things, data analytics, blockchain, and mobile-based platforms, these startups offer innovative solutions across pre-production planning, crop management, post-harvest handling, and agricultural marketing. Based on secondary data drawn from government reports, state publications, industry studies, and academic literature, this study examines the growth and impact of agri-tech startups in India, with special emphasis on Andhra Pradesh and Telangana. The findings indicate increased adoption of digital agriculture solutions in both states, supported by policy initiatives promoting precision farming, digital land records, e-market platforms, and technology-driven extension services. In Andhra Pradesh, electronic market integration, farmer producer organizations, and digital advisory platforms have enhanced market access and price realization. Similarly, Telangana's focus on digital governance, irrigation infrastructure, and startup incubation—particularly around Hyderabad—has fostered a strong agri-tech ecosystem. The study concludes that agri-tech startups contribute significantly to improved farm-level decision-making, reduced input costs, minimized post-harvest losses, and income stability, thereby promoting sustainable agriculture and inclusive rural development.

Keywords Agri-tech startups; Digital agriculture; Precision farming; Agricultural value chains; Andhra Pradesh and Telangana.

IMPACT OF DIGITAL MARKETING AND SOCIAL MEDIA ON THE VISIBILITY OF STREET VENDORS IN KADAPATOWN.

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ABSTRACT

In the fast changing environment of urban trade, the informal sector is undergoing a fundamental digital change, altering the old "street-side" business model. Historically, street sellers have relied almost entirely on actual foot traffic and local word-of-mouth, making them subject to economic swings and geographic constraints. Recently, social media platforms have emerged as strong tools for altering numerous elements of culture and society around the world. One of the areas heavily touched by social media is street food culture, particularly in countries such as India, where street food is an important element of culinary traditions. However, the proliferation of Smartphone's and easy access to the internet has enabled these micro- entrepreneurs to use digital marketing and social media platforms like Whats App, Instagram, and You Tube Shorts to go beyond their physical borders. The informal sector is just now starting to appreciate the promise of the rapidly evolving digital technology, which has completely changed commercial involvement. This study looks at how 120 street vendors in Kadapa town improve their visibility and commercial success through digital marketing and social media channels, including You Tube Shorts, Instagram, and Whats App. This study following a purposive sample and a descriptive study methodology was used to collect data from key hubs, including Trunk Road, Seven Roads Circle, Nehru Park, RTC Bus Stand, Rajiv Park, and Mahavir Circle.

Keywords Street Vendors, Digital Marketing, Social Media, Whats App Business, Instagram Marketing, Micro-entrepreneurship, Business Visibility, Customer Interaction.

FINTECH INNOVATIONS AND ITS IMPACT ON ENHANCING FINANCIAL INCLUSION AMONG INDIAN RETAIL INVESTORS WITH SPECIALREFERENCE TO IT SECTOR EMPLOYEES IN INDIA

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ABSTRACT

The rapid growth of financial technology (fintech) has significantly transformed the financial ecosystem in India, particularly by enhancing financial inclusion among retail investors. This study examines the impact of fintech innovations—such as digital payment platforms, mobile banking, robo-advisory services, online trading applications, and peer-to-peer lending—on improving access, affordability, and participation in financial markets among Indian retail investors, with special reference to employees in the Information Technology (IT) sector. The research explores how fintech-driven solutions reduce entry barriers, promote financial literacy, and facilitate informed investment decision-making. Using primary data collected from IT sector employees across major Indian technology hubs, the study analyzes the extent to which fintech adoption influences investment behavior, savings patterns, and inclusion in formal financial systems. The findings indicate that fintech innovations have played a crucial role in expanding financial access, increasing investment participation, and enhancing user convenience among IT professionals, while challenges such as cybersecurity concerns, digital literacy gaps, and regulatory awareness remain. The study provides meaningful insights for fintech firms, policymakers, and financial institutions to strengthen inclusive finance strategies and promote sustainable financial empowerment in India

Keywords Fin Tech Innovations; Financial Inclusion; Retail Investors; IT Sector Employees; Digital Finance; Investment Behavior; India

A STUDY ON SERVICE QUALITY OF ON-BOARD AND STATION SERVICE QUALITY AND THEIR INFLUENCE ON PASSENGER LOYALTY IN SOUTH RAILWAY

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ABSTRACT

Service quality plays a crucial role in shaping passenger experiences and fostering long-term loyalty in public transportation systems. This study examines the impact of on-board service quality and station service quality on passenger loyalty in the South Railway zone. On-board service quality is assessed through dimensions such as cleanliness, seating comfort, staff responsiveness, safety, and catering services, while station service quality includes factors like ticketing efficiency, waiting area facilities, signage, accessibility, and security. Using a structured questionnaire, data were collected from railway passengers traveling across major stations and trains in South Railway. The study employs statistical techniques such as descriptive analysis, correlation, and regression analysis to evaluate the relationship between service quality dimensions and passenger loyalty. The findings reveal that both on-board and station service quality have a significant and positive influence on passenger loyalty, with on- board service quality showing a stronger impact. The study highlights the importance of improving both travel-related and station-based services to enhance passenger satisfaction, encourage repeat travel, and strengthen loyalty toward South Railway services. The results offer practical insights for railway authorities to prioritize service quality improvements and implement passenger-centric strategies to remain competitive in the evolving transportation sector.

Keywords Service Quality; On-board Service Quality; Station Service Quality; Passenger Loyalty; South Railway; Indian Railways

THE INFLUENCE OF WORK-LIFE BALANCE ON SERVICE QUALITY WITH JOB SATISFACTION AS MEDIATOR.

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ABSTRACT

In today's demanding work environment, maintaining an effective work-life balance (WLB) has become a critical factor influencing employee attitudes and organizational performance, particularly in service-oriented sectors. This study examines the influence of work-life balance on service quality, with job satisfaction acting as a mediating variable. Grounded in organizational behavior and service management theories, the research investigates how employees' ability to balance professional and personal responsibilities enhances their satisfaction levels, which in turn positively affects the quality of services delivered. Using empirical data collected from service sector employees, the study employs statistical mediation analysis to assess the direct and indirect relationships among work-life balance, job satisfaction, and service quality. The findings reveal that work-life balance has a significant positive impact on job satisfaction and service quality, while job satisfaction partially mediates the relationship between work-life balance and service quality. The results underscore the importance of organizational policies and supportive work environments that promote work- life balance to improve employee well-being and service performance. The study offers practical implications for managers and policymakers seeking to enhance service quality through employee-centric human resource practices.

Keywords Work-Life Balance; Job Satisfaction; Service Quality; Mediation Effect; Service Sector; Employee Well-Being; Organizational Performance.

AI-DRIVEN BUSINESS ANALYTICS AND DECISION MAKING: A STUDY OF SELECTED SOFTWARE MNCS IN ANDHRA PRADESH AND TELANGANA

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ABSTRACT

The rapid advancement of Artificial Intelligence (AI) has significantly reshaped business analytics and decision-making in software-based multinational corporations (MNCs). In the emerging IT hubs of Andhra Pradesh and Telangana, software MNCs increasingly adopt AI- driven analytics to enhance operational efficiency and competitive performance. This study examines the role of AI-enabled analytics in managerial decision-making within these regions, utilizing a descriptive and analytical research design based exclusively on secondary data from industry reports and academic literature. Focusing on machine learning and predictive analytics, the analysis reveals that AI-driven tools improve forecasting accuracy, resource management, risk assessment, and decision speed. While organizations with higher analytics maturity demonstrate superior strategic responsiveness, critical challenges persist, including data governance issues, cybersecurity risks, and managerial skill gaps. The study concludes that AI analytics strengthens evidence-based decision-making and emphasizes the need for continuous investment in digital infrastructure, workforce upskilling, and robust governance frameworks to maximize benefits in the evolving IT ecosystem of Andhra Pradesh and Telangana.

Keywords Artificial Intelligence (AI); Business Analytics; Managerial Decision-Making; Software Multinational Corporations (MNCs); Predictive Analytics; Digital Transformation; Andhra Pradesh and Telangana

A STUDY ON WORK LIFE BALANCE PRACTICES FOR WOMEN EMPLOYEES IN IT ORGANIZATIONS IN TELANGANA STATE

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ABSTRACT

Work–life balance (WLB) plays a vital role in enhancing employee well-being and organizational effectiveness. Increasing work demands and family responsibilities often result in conflicts that negatively affect employees' psychological and social health. Telangana rapidly growing information technology (IT) sector presents both unique opportunities and significant challenges for women employees, particularly in relation to maintaining work–life balance. This study comprehensively examines the effectiveness of work–life balance practices adopted by IT organizations in the region. Using a mixed-methods approach, the research analyses organizational policies, workplace culture, and individual strategies that influence women's professional growth and personal well-being. Qualitative data were gathered through in-depth interviews and focus group discussions, while quantitative information was collected via surveys administered to women employees across various IT firms. The findings aim to provide a holistic understanding of the relationship between work–life balance, job satisfaction, and overall organizational performance.

Keywords Work–life balance, Organizational productivity.

LEADERSHIP AND MANAGERIAL ROLE IN PERFORMANCE MANAGEMENT SYSTEM (PMS) FOR EMPLOYEE RETENTION

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ABSTRACT

The evolution of Performance Management Systems (PMS) between 2020 and 2026 has transformed them from retrospective appraisal mechanisms into agile, technology-enabled frameworks that emphasize continuous feedback, coaching, and strategic alignment. This review synthesizes contemporary scholarship on the intersection of PMS, leadership, and employee retention, highlighting how leadership styles and managerial roles critically shape system effectiveness. Drawing on theories such as Social Exchange Theory, Leader–Member Exchange (LMX), Goal-Setting Theory, Equity Theory, and the Resource-Based View (RBV), the paper integrates evidence from diverse sectors to examine fairness perceptions, feedback quality, and developmental practices as mediating mechanisms of retention. Findings reveal that transformational and ethical leadership foster trust and engagement, while managerial coaching and fairness-oriented practices enhance PMS legitimacy and employee loyalty. Despite technological advancements, gaps remain in addressing algorithmic bias, managerial capability deficits, and contextual variations across industries. By positioning PMS as a strategic retention engine rather than an administrative tool, this review contributes to HRM scholarship and offers actionable insights for practitioners seeking to strengthen employee commitment in dynamic organizational environments.

Keywords Leadership; Managerial Role; Performance Management System (PMS); Employee Retention; Talent Management; Performance Appraisal; Employee Engagement; Organizational Commitment; Human Resource Management; Leadership Effectiveness.

WORKPLACE STRESS AND COPING STRATEGIES OF EMPLOYEES IN THE ITSECTOR

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ABSTRACT

Workplace stress has emerged as a significant challenge in the Information Technology (IT) sector due to rapid technological advancements, high performance expectations, tight deadlines, long working hours, and constant pressure to upgrade skills. These stressors not only affect the physical and psychological wellbeing of employees but also influence job satisfaction, productivity, and organizational effectiveness. The present study aims to identify the major sources of workplace stress among IT employees and coping strategies adopted by them to manage stress effectively. The study is based on secondary data from journals, reports, and published literature. The study also highlights that employee commonly adopt coping strategies such as time management, social support, physical exercise, relaxation techniques, and organizational support systems. The study concludes that effective stress management practices, supported by proactive HR interventions and employee wellness programs, can significantly reduce stress levels and improve employee performance and wellbeing in the IT sector.

Keywords Workplace Stress, Coping Strategies, IT Sector.

DIGITAL PAYMENTS: TRANSFORMING FINANCIAL MANAGEMENT INSMALL BUSINESSES

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ABSTRACT

Digital payments are revolutionizing financial management for small businesses by streamlining transactions and reducing reliance on cash. The study explores transformative impact of digital payments on operational efficiency and growth. Digital payments, encompassing mobile wallets, UPI, and card-based systems, have fundamentally reshaped financial operations in small businesses worldwide. By enabling faster, contactless transactions, these technologies minimize cash-handling costs, cut reconciliation time, and expand customer access—particularly in emerging markets like India. Studies highlight benefits such as increase in sales due to wider payment options and improved cash flow through real-time tracking, though challenges like cybersecurity risks and digital literacy gaps persist. Small enterprises adopting digital payments report enhanced scalability, with tools like QR codes and apps fostering customer loyalty via discounts and data analytics. Ultimately, this shift promotes financial inclusion, empowers entrepreneurs with actionable insights, and positions small businesses to thrive in a cashless economy.

Keywords Digital payments, Financial Management, small businesses.

GREEN MARKETING STRATEGIES: DRIVING SUSTAINABLE CONSUMER CHOICES

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ABSTRACT

In recent years, environmental concerns such as climate change, resource depletion, and pollution have significantly influenced consumer behavior and business practices. As a response, organizations across the globe are increasingly adopting green marketing strategies to promote environmentally responsible products and practices. Green marketing refers to the process of designing, pricing, promoting, and distributing products in a manner that minimizes negative impacts on the environment while satisfying consumer needs. This paper aims to examine the concept of green marketing, its importance in today's competitive business environment, and the role it plays in achieving sustainable development. It explores various green marketing practices adopted by firms, including eco-friendly product design, sustainable packaging, ethical advertising, and the use of renewable resources. The study also highlights the benefits of green marketing, such as enhanced brand image, customer loyalty, cost efficiency, and long-term profitability. Further, the paper discusses key challenges faced by organizations in implementing green marketing strategies, including high initial costs, lack of consumer awareness, and the risk of greenwashing. Through a review of existing literature and real-world examples, the study emphasizes the need for genuine commitment from organizations towards environmental responsibility. The paper concludes that green marketing is not merely a promotional strategy but a vital business philosophy that contributes to environmental protection, consumer trust, and sustainable economic growth.

Keywords Green Marketing, Sustainability, environmental protection.

MANAGING THE GEN Z WORKFORCE: CHALLENGES AND STRATEGIES FORMODERN ORGANIZATIONS

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ABSTRACT

The entry of Generation Z into the workforce has significantly transformed the dynamics of modern organizations. Born between the mid-1990s and early 2010s, Gen Z employees are characterized by digital fluency, a strong preference for flexibility, diversity, meaningful work, and continuous feedback. While these traits bring innovation and adaptability, they also pose distinct challenges for managers accustomed to traditional management practices. Issues such as short attention spans, high expectations for work–life balance, resistance to rigid hierarchies, and rapid job mobility demand a rethinking of organizational policies and leadership approaches. This paper examines the key challenges faced by organizations in managing the Gen Z workforce and proposes effective strategies to address them. It highlights the importance of adaptive leadership, technology-enabled communication, flexible work arrangements, continuous learning opportunities, and purpose-driven organizational cultures. The study emphasizes the role of human resource management in aligning Gen Z values with organizational goals through inclusive practices, employee engagement initiatives, and performance management systems that prioritize feedback and development. By understanding the unique expectations of Gen Z employees, modern organizations can leverage their strengths to enhance productivity, innovation, and long-term sustainability.

Keywords Gen Z, leadership, organizational culture.

DIGITAL MARKETING AS A DRIVER OF COMPETITIVE ADVANTAGE

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ABSTRACT

In an increasingly digitalized business environment, digital marketing has emerged as a critical driver of competitive advantage for organizations across industries. The rapid growth of online platforms, social media, search engines, and data analytics has transformed how firms interact with customers, build brand value, and compete in the marketplace. This paper examines the role of digital marketing in creating and sustaining competitive advantage by enhancing customer engagement, improving market reach, and enabling data-driven decision-making. The study explores key digital marketing tools such as search engine optimization, social media marketing, content marketing, email marketing, and online advertising, and analyzes their impact on brand visibility, customer loyalty, and organizational performance. It also highlights how personalization, real-time communication, and performance measurement contribute to differentiation and cost efficiency. The paper emphasizes that effective integration of digital marketing strategies with overall business objectives allows firms to respond swiftly to market changes and consumer preferences.

Keywords Digital Marketing, Strategy, Competitive Advantage.

AI IN MARKETING MANAGEMENT USING MACHINE LEARNING AND DEEPLEARNING

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ABSTRACT

Artificial Intelligence (AI) has emerged as a transformative force in marketing management by enabling organizations to make data-driven, accurate, and strategic decisions. The integration of Machine Learning (ML) and Deep Learning (DL) techniques allows marketers to analyze large volumes of customer data, predict consumer behavior, optimize pricing strategies, and improve customer relationship management. This paper explores the role of AI in marketing management, focusing on the applications of ML and DL models in decision-making, customer segmentation, demand forecasting, and brand management. The study highlights how AI-based marketing management enhances efficiency, personalization, and competitive advantage in modern business environments.

Keywords Artificial Intelligence, Marketing Management, Machine Learning, Deep Learning, Predictive Analytics, Customer Behavior.

SMART HUMAN RESOURCE MANAGEMENT USING ARTIFICIAL INTELLIGENCE

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ABSTRACT

Artificial Intelligence (AI) is transforming traditional Human Resource Management (HRM) into a smarter and more strategic function. Smart Human Resource Management using AI focuses on improving efficiency, decision-making, and employee experience through technologies such as machine learning, chatbots, predictive analytics, and automation. This paper examines the concept of AI-driven HRM, its applications in recruitment, training, performance management, and employee engagement. It also discusses the challenges and ethical concerns associated with AI adoption in HR practices.

Keywords Artificial Intelligence, Smart HRM, Recruitment, Machine Learning, Employee Engagement.

SOCIAL MEDIA AS A DRIVER OF CUSTOMER ENGAGEMENT IN THE DIGITAL ERA

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ABSTRACT

In the digital era, social media has emerged as a powerful platform reshaping how organizations communicate and build relationships with customers. This paper explores the role of social media as a key driver of customer engagement by examining the ways in which digital interactions influence customers' cognitive, emotional, and behavioral involvement with brands. Grounded in engagement and relationship marketing perspectives, the study discusses how social media features such as interactivity, content sharing, real-time communication, and community building contribute to enhanced customer participation and brand connection. The paper also highlights the significance of both brand-generated and user-generated content in fostering meaningful engagement experiences. By synthesizing existing literature and conceptual insights, this study provides a structured understanding of how social media facilitates ongoing customer engagement in the digital environment. The paper aims to offer valuable insights for students, educators, and practitioners by emphasizing the strategic importance of social media in developing long-term customer relationships and sustaining competitive advantage in an increasingly connected marketplace.

KeywordsSocial Media, Customer Engagement, Digital Marketing, Relationship Marketing, Digital Era

A STUDY ON INVESTOR PERCEPTION TOWARDS HDFC MUTUAL FUNDS

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ABSTRACT

This study examines the investor perception towards HDFC Mutual Funds, exploring the various factors that influence investment decisions and satisfaction levels among investors in the mutual fund market. Investor perception plays a vital role in determining investment choices, portfolio allocation, and long-term wealth creation strategies. The research employs a descriptive research design, utilizing primary data collected through structured questionnaires distributed to existing and potential investors of HDFC Mutual Funds, complemented by secondary data from financial reports, research articles, and company publications. The study analyzes key factors affecting investor perception including fund performance, risk-return profile, brand reputation, transparency, fund manager expertise, investment objectives, expense ratios, diversification benefits, and customer service quality. Various statistical techniques are applied to assess investor awareness, preferences, satisfaction levels, and behavioral patterns in mutual fund investments. The findings identify the strengths of HDFC Mutual Funds from an investor perspective and highlight areas requiring attention to enhance investor confidence and participation. The study provides valuable insights and recommendations for improving marketing strategies, investor education, product innovation, and service delivery, thereby helping HDFC Mutual Fund strengthen its market position, attract new investors, and retain existing clientele in the competitive asset management industry.

Keywords Investor Perception, HDFC Mutual Funds, Investment Decisions, Mutual Fund Performance, Risk-Return Analysis.

AI-DRIVEN STOCK MARKET TREND ANALYSIS – FUTURE OF INVESTMENT

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ABSTRACT

Financial markets are inherently complex, non-linear, and influenced by a wide range of structured and unstructured data sources, including price movements, macroeconomic indicators, corporate fundamentals, and news sentiment. Recent advances in Artificial Intelligence (AI) and Machine Learning (ML) have significantly enhanced the capability to model such complexity for stock market trend analysis and investment decision-making. This paper explores the application of AI-driven techniques—such as supervised and unsupervised learning, deep neural networks, and sentiment analysis—for predicting market trends and optimizing investment strategies. The proposed framework integrates historical price data with external information sources to improve predictive accuracy and robustness. Experimental insights indicate that AI-based models can outperform traditional statistical methods in capturing market patterns and short-term price dynamics. Despite challenges related to data quality, model interpretability, and market volatility, AI-driven analytics demonstrate strong potential in shaping the future of intelligent, automated, and data-driven investment systems. The findings suggest that AI-driven stock market analysis improves prediction accuracy, enhances risk assessment, and supports real-time investment decision-making. AI systems also reduce human bias and enable personalized investment strategies. The study concludes that AI- driven trend analysis represents a significant advancement in modern investment practices and will play a crucial role in shaping the future of intelligent, data-driven investment management.

KeywordsArtificial Intelligence, Stock Market Analysis, Machine Learning, Predictive Analytics, Investment Strategies, Financial Technology

EMERGING TRENDS IN DIGITAL BANKING

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ABSTRACT

Digital banking represent a transformative shift in the financial sector by integrating advanced digital technology's with traditional banking operations. It Enables fast, secure, and paperless financial services through platforms such as mobile banking, UPI, and fintech collaborations. The adoption of artificial intelligence, data analytics, and automation Enhance customer experience, risk management, and.operational efficiency. Digital banking also plays a significant role in promoting financial inclusion by expanding access to banking services across diverse population. Cloud based infrastructure and robust cybersecurity framework ensures scalability, resilience, and regulatory compliance. Finance in digital banking focuses on seamless fund transfers and digital lending real time, payments automated, customer support and secure financial transactions. Technology's like AI based chat bots and robo advisory services are redefining customer experience by providing instant supported investment guidance. Overall all digital banking services as a strategic driver of innovation, competitiveness, and sustainable growth in the modern financial ecosystem.

Keywords UPI, Finetech, Data analytics, AI, Cloud computing, automation, financial inclusion, digital transformation.

EMERGING TRENDS IN FINANCIAL MANAGEMENT MODERN FINANCIAL MANAGEMENT PRACTICES IN DIGITAL ERA

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ABSTRACT

In the present digital era, financial management is undergoing significant transformation due to the adoption of Artificial Intelligence (AI). AI-driven financial management enables organizations to analyze large volumes of financial data, improve accuracy, and enhance decision-making processes. This paper examines the role of AI in modern financial management, focusing on areas such as financial planning and forecasting, investment analysis, risk management, fraud detection, and financial reporting. AI technologies such as machine learning, predictive analytics, and automation help organizations optimize resource utilization, reduce operational costs, and minimize financial risks. The study also highlights the benefits of AI-based financial systems, including real-time insights, improved efficiency, and strategic financial control. Despite challenges such as data security concerns and high implementation costs, AI-driven financial management offers immense potential for sustainable business growth and competitive advantage in today's dynamic business environment.

Keywords Artificial Intelligence, Financial Management, Financial Analytics, Risk Management, Digital Finance.

EMERGING TRENDS IN HUMAN RESOURCE MANAGEMENT: A MANAGEMENT AND COMPUTER APPLICATION PERSPECTIVE

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ABSTRACT

Human Resource Management (HRM) has experienced a significant transformation in recent years due to rapid technological advancements, globalization, and evolving workforce expectations. The traditional role of HR as an administrative support function has expanded into a strategic partner contributing to organizational growth and competitiveness. This paper examines emerging trends in HRM from both management and computer application perspectives. It explores how strategic human resource practices, supported by digital technologies such as Human Resource Information Systems (HRIS), artificial intelligence, automation, cloud computing, and HR analytics, are reshaping core HR functions including recruitment, performance management, training, and employee engagement. The study is based on secondary data collected from academic journals, books, conference proceedings, and research reports. The findings highlight that technology-enabled HRM improves operational efficiency, enhances data-driven decision-making, and strengthens employee experience and organizational effectiveness. Using a descriptive and exploratory research design, the study is based on secondary data collected from research journals, books, conference papers, and credible online sources. The paper concludes that the successful integration of managerial competencies with advanced computer applications is essential for building agile, innovative, and sustainable organizations in the digital era.

Keywords Human Resource Management, Digital HRM, HR Analytics, Artificial Intelligence, e-HRM

EMERGING TRENDS IN MARKETING MANAGEMENT: CUSTOMER RELATIONSHIP MANAGEMENT IN THE DIGITAL ERA

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ABSTRACT

Customer Relationship Management (CRM) has emerged as a critical component of marketing management in the digital era, enabling organizations to build, maintain, and strengthen long- term relationships with customers. With the rapid growth of digital technologies, social media platforms, big data, and artificial intelligence, CRM has evolved from a traditional customer database system into a strategic, technology-driven marketing tool. Digital CRM integrates customer data across multiple touchpoints, allowing organizations to deliver personalized experiences, improve customer satisfaction, and enhance customer loyalty. This paper examines CRM as an emerging trend in marketing management, highlighting its role in understanding consumer behavior, improving decision-making, and gaining competitive advantage in a highly dynamic business environment. The study also discusses the challenges and future prospects of CRM implementation in the digital age, emphasizing its importance for sustainable business growth.

Keywords Customer Relationship Management, Digital Marketing, Marketing Management, Customer Satisfaction, Customer Loyalty.

INTEGRATION OF AI IN FINANCIAL MANAGEMENT

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ABSTRACT

The integration of Artificial Intelligence (AI) is reshaping contemporary financial management by enhancing analytical capability, operational efficiency, and strategic decision-making. This study investigates the role and impact of AI in modern financial management with specific emphasis on its applications in budgeting, forecasting, risk assessment, fraud detection, and managerial decision processes. The objective of the research is to examine how AI technologies contribute to improved financial performance while also identifying the opportunities and challenges associated with their adoption. The study follows a descriptive research design and is based on secondary data collected from scholarly journals, research papers, industry publications, and online reports. The analysis indicates that AI significantly improves accuracy, automation, and predictive efficiency in financial operations, enabling organizations to optimize resource allocation and strengthen financial planning. Furthermore, AI-based systems enhance risk management and fraud detection through real-time data processing and machine learning techniques. However, the study also identifies major constraints, including high implementation costs, data security and privacy concerns, ethical issues, and the shortage of skilled professionals. The findings suggest that despite these challenges, AI has substantial potential to transform financial management practices. The study concludes that the strategic integration of AI will play a crucial role in shaping the future of the finance industry and in improving organizational competitiveness.

Keywords Artificial Intelligence, Financial Management, Budgeting, Forecasting, Risk Management, Decision-Making, Automation.

INTEGRATIN OF AI IN MARKETING AND CUSTOMER SATISFACTION

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ABSTRACT

Artificial Intelligence (AI) has emerged as a powerful tool in modern business marketing, significantly transforming the way organizations interact with customers and make marketing decisions. This paper explores the integration of AI technologies into business marketing practices and examines their influence on overall business performance. AI applications such as machine learning, data analytics, chatbots, and recommendation systems enable businesses to collect and analyze large volumes of customer data, understand consumer behavior, and deliver personalized marketing messages. The study highlights how AI improves marketing efficiency by automating routine tasks, optimizing advertising campaigns, and supporting accurate demand forecasting. AI-driven marketing strategies help businesses enhance customer experience, build stronger customer relationships, and improve brand loyalty. In addition, the use of predictive analytics allows organizations to anticipate market trends and make informed strategic decisions. However, the paper also discusses challenges associated with the adoption of AI in marketing, including data privacy concerns, ethical issues, high implementation costs, and the need for skilled human resources. The findings suggest that AI does not replace human marketers but acts as a supportive tool that enhances creativity and strategic planning. The study concludes that the responsible and effective integration of AI in business marketing can provide organizations with a sustainable competitive advantage in the evolving digital marketplace.

Keywords Artificial Intelligence (AI), Business Marketing, Digital Marketing, Machine Learning, Data Analytics, Customer Experience, Predictive Analytics, Marketing Automation, Business Performance, Ethical Issues.

DIGITAL TANSFORMATION IN BUSINESS ANALYTICS

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ABSTRACT

Digital transformation has become a strategic imperative for modern organizations as rapid advancements in data technologies redefine how businesses operate and compete. In the context of business analytics, digital transformation enables organizations to convert vast volumes of structured and unstructured data into actionable insights that support informed decision-making, operational efficiency, and sustainable competitive advantage. This paper explores the role of digital transformation in business analytics, emphasizing the integration of advanced technologies such as big data analytics, artificial intelligence, cloud computing, and machine learning. It highlights how these technologies enhance analytical capabilities, improve business performance, and enable data-driven strategies across industries. The study also discusses key challenges faced by organizations during digital transformation, including data security, skill gaps, and organizational resistance to change. By providing a conceptual overview, this paper aims to contribute to the understanding of digital transformation as a critical driver of innovation and value creation in business analytics.

Keywords Digital Transformation, Business Analytics, Big Data Analytics, Artificial Intelligence, Cloud Computing, Machine Learning, Data-Driven Decision Making, Organizational Performance

EMERGING TRENDS IN DIGITAL MARKETTING MANAGEMENT AND COMPUTER APPLICATION PERSPECTIVE

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ABSTRACT

Digital transformation of marketing refers to the adoption and integration of digital technologies into marketing strategies and processes to enhance customer engagement, optimize marketing performance, and support business growth. With the rise of digital platforms, big data, artificial intelligence, and automation, organizations are moving from traditional marketing methods toward data-driven and customer-centric approaches. Digital transformation enables real-time analysis of consumer behavior, personalized communication, and effective multi-channel marketing. Despite its advantages, marketers face challenges such as data privacy issues, technological complexity, and the need for skilled digital talent. Overall, digital transformation has become essential for organizations aiming to remain competitive in the rapidly evolving digital marketplace.

KeywordsDigital Marketing, Digital Transformation, Customer Experience, Data Analytics, Marketing Automation, Artificial Intelligence

A STUDY ON CUSTOMER SATISFACTION OF TVS MOTORS IN KADAPA DISTRICT

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ABSTRACT

This study investigates the level of customer satisfaction towards TVS Motors in Kadapa District, examining various factors that influence customer perception and buying behavior in the two-wheeler automobile sector. Customer satisfaction is a critical determinant of business success, brand loyalty, and competitive advantage in the highly competitive automotive industry. The research adopts a descriptive research design, collecting primary data through structured questionnaires administered to TVS Motors customers in Kadapa District, supplemented by secondary data from company records and publications. The study analyzes key dimensions of customer satisfaction including product quality, after-sales service, pricing, brand image, availability of spare parts, service center efficiency, staff behavior, and overall customer experience. Various statistical tools and techniques are employed to measure satisfaction levels and identify the factors that significantly impact customer preferences and retention. The findings reveal the strengths and areas requiring improvement in TVS Motors' customer service delivery and product offerings. The study provides valuable insights and actionable recommendations for enhancing customer satisfaction, improving service quality, strengthening customer relationships, and maintaining competitive positioning in the Kadapa District market, thereby contributing to increased customer loyalty.

A STUDY ON FUNDS FLOW STATEMENT ANALYSIS OF MEGHA AGROTECH LTD

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ABSTRACT

This study examines the funds flow statement of Megha Agrotech Ltd over a five-year period from 2020 to 2024, analyzing the sources and applications of funds and their impact on the company's financial position. The research employs funds flow analysis to assess how the company has generated and utilized its financial resources during this period, focusing on changes in working capital, long-term investments, financing decisions, and operational efficiency. Through systematic analysis of the company's financial statements, this study identifies the major sources of funds including funds from operations, equity capital, loans, and asset disposals, as well as the primary applications such as capital expenditure, dividend payments, debt repayment, and working capital requirements. The findings provide insights into the financial management practices of Megha Agrotech Ltd, revealing trends in liquidity management, investment strategies, and overall financial health. This analysis serves as a valuable tool for stakeholders including investors, creditors, and management to understand the company's fund utilization patterns and make informed decisions regarding future
financial planning and strategic development.

Keywords Funds Flow Statement, Working Capital, Financial Analysis,

A STUDY ON WORKING CAPITAL MANAGEMENT OF HONDA COMPANY IN KADAPA DISTRICT

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ABSTRACT

This study examines the working capital management practices of Honda Company in Kadapa District, focusing on the efficiency and effectiveness of managing current assets and current liabilities. Working capital management is crucial for maintaining liquidity, ensuring smooth business operations, and achieving profitability. The research employs a descriptive and analytical approach using secondary data collected from the financial statements and annual reports of the company. The study analyzes key components of working capital including inventory management, receivables management, cash management, and payables management. Various financial ratios such as current ratio, quick ratio, inventory turnover ratio, debtor turnover ratio, and working capital turnover ratio are calculated to assess the liquidity position and operational efficiency of Honda Company during the study period. The findings reveal the company's strategies in balancing liquidity and profitability, identifying strengths and weaknesses in working capital management practices. The study provides valuable insights and recommendations for improving working capital efficiency, which will benefit the management in making informed decisions regarding fund allocation, inventory control, credit policy, and cash management to enhance overall financial performance and Keywords Working Capital Management, Liquidity, Current Assets, Current Ratio.

A PROJECT REPORT ON CUSTOMER SATISFACTION TOWARDS YEZDI JAWA BIKES WITH SPECIAL REFERENCE TO KADAPA DISTRICT

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ABSTRACT

This research work was carried out to gain a clear understanding of customer expectations regarding the services provided for Yezdi and Jawa brand motorcycles. The study focused on customer satisfaction, which provided valuable insights into what customers expect from the company to ensure satisfactory service delivery. The required information for this research was collected from both primary and secondary data sources through direct interaction with customers and from existing company records. The report encompasses the need, scope, objectives, limitations, methodology, findings, and suggestions of the study. To obtain results, feedback was collected from customers using a structured questionnaire, and the data was analyzed thoroughly. The sample size consisted of 150 respondents. The major component of this research involved analyzing and interpreting the collected data. Statistical analysis using the ANOVA method was employed to test the hypothesis and draw conclusions.

Keywords Customer satisfaction, customer requirements, customer expectations, service quality, Yezdi motorcycles, Jawa motorcycles

NEURO MARKETING INFLUENCES

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ABSTRACT

Neuromarketing is a modern marketing approach that applies principles of neuroscience and behavioral science to study how consumers react to marketing messages at an unconscious level. It focuses on understanding emotional, cognitive, and sensory responses that influence buying behavior. By using tools such as brain-imaging techniques, eye-tracking, and biometric analysis, marketers can identify what captures attention, creates emotional connection, and drives decision-making. Neuromarketing strongly influences consumer preferences by shaping perceptions of brands, advertisements, packaging, and pricing strategies. Since most purchasing decisions are emotion-driven rather than rational, neuromarketing helps organizations design more impactful and persuasive marketing campaigns. However, the use of neurological data also raises ethical concerns related to privacy, transparency, and consumer manipulation. When applied responsibly, neuromarketing provides valuable insights into consumer behavior and improves the effectiveness of marketing strategies. Overall, neuromarketing plays a crucial role in enhancing customer engagement and competitive advantage in today's dynamic market environment.

KeywordsNeuromarketing, Consumer Behavior, Neuroscience, Subconscious, Decision-Making, Emotional, Response, Eye Tracking, EEG(Electroencephalography), Biometric, Measurements, Brand Perception, Sensory Marketing, Customer Engagement, Consumer Psychology.

A STUDY ON PRICEING STRATEGY IN BMW COMPANY

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ABSTRACT

The pricing strategy of luxury automobile brands plays a crucial role in shaping consumer perception, market competitiveness, and organizational profitability. This study aims to analyze the pricing strategies adopted by BMW Company in Chennai and evaluate their impact on customer perception, market performance, and competitive positioning in the luxury automobile industry. The research focuses on understanding the components of BMW's pricing strategy, including premium pricing, value-based pricing, and geographical pricing adjustments. The study is based on both primary and secondary data. Primary data were collected through questionnaires from customers and dealers, while secondary data were obtained from company reports, industry publications, and academic sources. Various analytical tools such as descriptive statistics, comparative analysis, and SWOT analysis were used to interpret the data. The findings reveal that BMW successfully uses premium pricing to maintain its luxury brand image and attract high-income customers. Brand prestige, technological innovation, and performance are the major factors influencing customers' willingness to pay higher prices. However, the study also identifies price sensitivity in entry- level luxury models and increasing competitive pressure from brands like Mercedes-Benz, Audi, and Tesla, especially in the electric vehicle segment. The study concludes that while BMW's pricing strategy is effective in sustaining its premium market position, there is a need for flexible pricing policies in emerging markets and entry-level segments. Recommendations include adopting region-specific pricing strategies, enhancing value-based pricing for electric vehicles, and introducing flexible financing and promotional offers to increase market share and customer satisfaction.

A STUDY ON TRAINING AND DEVELOPMENT OF YEZDI JAWA COMPANY IN KADAPA DISTRICT

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ABSTRACT

Training and development play a significant role in enhancing skill levels, productivity, and service quality in the motorcycle servicing sector. This study focuses on the training and development practices related to Yezdi and Jawa bikes in Kadapa District. Yezdi and Jawa motorcycles, once iconic names in the Indian two-wheeler market, have recently experienced renewed interest due to nostalgia and a growing preference for retro bikes. With this resurgence, there has been an increased demand for skilled technicians who can effectively maintain and repair these classic models. The research examines the current training programs available for mechanics and service personnel in Kadapa, the relevance of these programs to industry needs, and the impact of structured training on customer satisfaction and business performance.

Primary data was collected through interviews with bike owners, service canter managers, and technicians, while secondary data includes company records and training materials. The findings indicate that although basic mechanical skills are present among many technicians, specialized training related to the unique technical requirements of Yezdi and Jawa bikes remains limited. Consequently, service centres that invest in targeted development programs tend to perform better in terms of service quality and customer loyalty. The study concludes that formal, continuous training initiatives tailored to these bike models are crucial for sustaining the growth of the servicing ecosystem in Kadapa District. Recommendations include partnerships with manufacturers, structured apprenticeships, and certification programs for technicians.

Key words: Training and Development, HR Practices, Yezdi Bikes, Jawa Motorcycles, Automobile Dealerships, Employee Performance, Technical Training, Sales Skills, Kadapa District.

A STUDY ON EMPLOYEE JOB SATISFACTION AT KIA MOTORS IN KADAPA

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ABSTRACT

Employee job satisfaction is an important factor that influences organizational performance, productivity, employee retention, and overall workplace harmony. In today's competitive business environment, organizations are focusing on improving employee satisfaction to enhance motivation, reduce turnover, and achieve long-term organizational success. Job satisfaction refers to the level of contentment employees feel regarding their job roles, work environment, compensation, career growth opportunities, and organizational policies.

Kia Motors India Pvt. Ltd. is one of the leading automobile manufacturing companies in India, with its production facility located in Kadapa district, Andhra Pradesh. The company employs a large workforce in manufacturing, engineering, administration, and support functions. Understanding employee job satisfaction at Kia Motors is essential for improving employee performance and maintaining a positive organizational climate.

The present study aims to analyze the level of job satisfaction among employees working at Kia Motors in Kadapa.

KeywordsEmployee Job Satisfaction, Human Resource Management, Kia Motors India Pvt. Ltd., Working Conditions, Compensation, Training and Development, Employee Welfare, Organizational Performance.

BUDGETING AND COST CONTROL: A STUDY OF TAJ HOTEL

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ABSTRACT

This study examines the budgeting and cost control practices implemented at Taj Hotel over a fiveyear period from 2020 to 2025, a timeframe marked by unprecedented challenges including the COVID-19 pandemic, economic recovery, and evolving industry dynamics. The research analyses the hotel's financial planning mechanisms, cost management strategies, and budget allocation processes during this transformative period. Through a comprehensive analysis of financial data, operational reports, and performance metrics, the study evaluates how Taj Hotel adapted its budgetary controls to navigate pandemic-induced disruptions, implement cost- optimisation measures, and maintain financial sustainability while preserving service quality. The findings reveal significant shifts in cost structure management, revenue forecasting methods, and expense control techniques employed by the hotel to remain competitive in the post-pandemic hospitality landscape. This study provides valuable insights into effective budgeting practices and cost control mechanisms that can be adopted by luxury hotels facing similar economic uncertainties and operational challenges.

Keywords Budgeting, Cost Control, Taj Hotel, Hospitality Management, Financial Planning

ORCHESTRATING CARE DESIGNING A SMART MUSIC THERAPY SERVICE MODEL FOR AUTISM

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ABSTRACT

Autism Spectrum Disorder (ASD) calls for care models that are not only effective but also responsive to the unique and changing needs of each individual. Music therapy has long been recognized as a supportive intervention for improving social interaction, communication, and emotional regulation in individuals with ASD. However, in many real-world settings, therapy delivery remains largely manual, static, and disconnected from continuous feedback. This paper presents a smart music therapy service model that brings together Artificial Intelligence (AI) and Internet of Things (Io T) technologies to better coordinate and personalize autism care. The study builds on a focused review of prior research in autism therapy, digital health, and intelligent service systems, along with insights drawn from existing practices and the conceptual design of a prototype framework. In the proposed model, Io T-enabled devices capture behavioural and physiological responses during therapy sessions, while AI-based analysis supports adaptive selection and modulation of musical elements in real time. The expected outcomes include improved engagement, communication, and emotional responsiveness among individuals with ASD, as well as smoother coordination between therapists, caregivers, and support systems. By shifting music therapy from a static intervention to a responsive, data-supported service, this work highlights how intelligent technologies can play a meaningful role in delivering more personalized, scalable, and integrated autism care.

Keywords Autism Spectrum Disorder (ASD), Music Therapy, Artificial Intelligence, Internet of Things, Smart Healthcare, Personalized Care

AI DRIVEN BUSINESS ANALYTICS: A STUDY ON THE ADOPTION TRENDS OF SMART LAVATORIES IN ANDHRA PRADESH: FORECASTING KOHLER SMART TOILET UTILIZATION FOR 2025

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ABSTRACT

This study investigates the adoption trends of smart lavatories in Visakhapatnam (Vizag), Andhra Pradesh, specifically focusing on the market performance and future utilization of the Kohler brand for the year 2025. As Vizag undergoes rapid urbanization under the "Smart City". initiative, this research explores the shift in consumer behaviour within the luxury home. segment, analysing key drivers such as hygiene consciousness and smart home integration against barriers like high initial costs and infrastructure concerns. Utilizing a mixed-methods approach, the study incorporates qualitative insights from real estate developers and architects alongside a quantitative survey of 51 respondents. Findings indicate a split and hesitant market sentiment, where combined negative purchase intent (40.0%) slightly outweighs positive intent (36.0%). Descriptive statistics identify "Likely" as the single most frequent response (Mode), yet the midpoint (Median) remains neutral. Notably, a Chi Square Test of Independence revealed no statistically significant relationship between a consumer's willingness to pay and their likelihood of purchase (), suggesting that non-price factors like brand aspiration and perceived status are primary drivers for adoption. The research concludes with a practical forecast linking utilization to the 2025 completion cycles of high-end residential and commercial projects, providing a strategic roadmap for manufacturers and urban planners in the region.

Keywords- Smart Lavatories, Consumer Adoption Trends, Market Forecasting 2025, Luxury Real Estate

EMERGING TRENDS IN FINANCIAL MANAGEMENT IN THE DIGITAL ERA

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ABSTRACT

The digital era has significantly transformed the field of financial management by introducing advanced technologies, data-driven decision-making, and innovative financial practices. Traditional financial management, which mainly focused on budgeting, accounting, and cost control, is now evolving into a strategic function that supports long-term value creation. Emerging trends such as artificial intelligence, big data analytics, cloud computing, blockchain technology, and financial automation have enhanced the accuracy, speed, and transparency of financial decisions. Digital tools enable organizations to improve financial planning, forecasting, risk management, and performance evaluation. Furthermore, the rise of fintech and digital payment systems has reshaped corporate finance and cash management practices. Along with technological advancements, there is a growing emphasis on cybersecurity, regulatory compliance, sustainability, and ethical financial management. This paper examines the major emerging trends in financial management in the digital era and highlights their impact on organizational efficiency, competitiveness, and financial stability. The study concludes that adopting digital innovations is essential for modern financial managers to remain effective in a rapidly changing business environment.

Keywords Introducing advanced technologies, data-driven decision-making, Emerging trends such as artificial intelligence, performance evaluation, cybersecurity, transparency of financial

A STUDY ON TRAINING AND DEVELOPMENT IN KIA MOTORS

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ABSTRACT

Human Resource Management (HRM) is a vital function that ensures effective utilization of human resources in an organization. In today's competitive business environment, organizations focus on attracting, developing, and retaining talented employees to achieve sustainable growth. Tata Consultancy Services (TCS) Ltd., one of India's leading IT companies, emphasizes strategic HR practices to enhance employee performance and organizational productivity. This study aims to analyze the HRM practices at TCS Ltd., with special reference to recruitment and selection, training and development, performance appraisal, compensation, and employee welfare measures. The research evaluates how these HR practices influence employee satisfaction, motivation, and organizational efficiency. Both primary and secondary data were used to assess HR policies and their implementation. The findings of the study reveal that TCS follows structured and systematic HR policies that contribute to high employee engagement and retention. Effective training programs, transparent performance appraisal systems, and competitive compensation packages help in improving employee productivity and organizational performance. The study concludes that strong HRM practices play a significant role in achieving organizational success and employee satisfaction.

KeywordsHuman Resource Management, Employee Satisfaction, Recruitment and Selection, Training and Development, Performance Appraisal, Tata Consultancy Services (TCS)

IMPACT OF DIGITAL PAYMENT SYSTEM ON STREET VENDORS IN KADAPA TOWN ANDHRA PRADESH

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ABSTRACT

After demonetization digital transactions increased and the Pradhan Mantri Jan Dhan Yojna was introduced for everyone to open their bank account. There are various methods for digital payments. Some of the platforms for digital payments are debit card, credit card, Net Banking, E-wallets such as phone pay, Google pay, Paytm, Bharat Pay, Amazon pay etc. and RTGS. Now, not only E-Commerce companies but consumers, street vendors, traders and other sectors of societies also prefer digital payments due to its fast and secure transaction facility. On the other hand, limited understanding and adoption of digital payment systems is the main problem among street vendors. It affects their ability to capitalize on the potential benefits of digital transactions. While digital payments can enhance business efficiency, improve financial inclusion, and expand customer reach, many street vendors face challenges. Hence, this study aims to analyze the impact of digital payment system on street vendors.

Keywords Digital Payment, Vendor, QR code, Digital Divide.

AI- DRIVEN LEARNING AND GRADUATE JOB READINESS: REFRAMING SERVICE QUALITY IN HIGHER EDUCATION INSTITUTIONS

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ABSTRACT

The growing adoption of artificial intelligence (AI) in higher education has reshaped teaching– learning processes and transformed traditional perceptions of service quality. This study explores the role of AI-driven learning in enhancing graduate job readiness by reframing service quality within higher education institutions. It examines how AI-enabled tools such as adaptive learning systems, intelligent tutoring, learning analytics, and virtual simulations support personalized learning, skill development, and industry alignment among graduates. The study draws on service quality and employability frameworks to analyse the relationship between higher education service quality dimensions and graduate job readiness, with AI- driven learning acting as a critical catalyst. The findings indicate that AI-based personalization, real-time feedback, and data-driven academic support significantly improve students' technical competencies, soft skills, and employability outcomes. Furthermore, AI-driven learning strengthens service quality by improving instructional effectiveness, student support services, and outcome-based education practices. The study concludes that integrating AI-driven learning into higher education service quality frameworks is essential for preparing graduates for dynamic labour market demands. It recommends strategic investments in AI infrastructure, faculty capability development, and curriculum redesign to ensure sustainable and inclusive implementation of AI-driven education.

Keywords AI-Driven Learning, Graduate Job Readiness, Higher Education Service Quality, Employability Skills, Digital Transformation, Outcome-Based Education.

A STUDY ON WORKING CAPITAL MANAGEMENT WITH REFERENCE TO CHAITANYA CHEMICALS, KADAPA

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ABSTRACT

Working capital management is a critical aspect of financial management that ensures the smooth functioning and short-term solvency of an organization. The present study analyses the working capital management practices of Chaitanya Chemicals, Kadapa, with the aim of evaluating the efficiency in managing current assets and current liabilities. The study is based on secondary data collected from the company's published financial statements for a selected period. Key elements of working capital such as cash, inventory, debtors, and creditors are examined using ratio analysis, trend analysis, and working capital turnover ratios. The study assesses the liquidity position and operational efficiency of the company and identifies the relationship between working capital management and overall financial performance. The findings reveal that effective management of working capital has contributed to maintaining adequate liquidity and supporting uninterrupted production operations. However, fluctuations in inventory levels and receivables turnover suggest the scope for improving control measures and credit policies. The study concludes that efficient working capital management is essential for enhancing profitability and financial stability. It suggests adopting better inventory planning, strengthening receivables management, and improving cash flow monitoring to achieve optimal utilization of working capital.

Keywords Working Capital Management, Liquidity, Current Assets, Current Liabilities, Financial Performance, Manufacturing Industry.

A STUDY ON RATIO ANALYSIS WITH REFERENCE TO CHAITANYA CHEMICALS, KADAPA

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ABSTRACT

Ratio analysis is a widely used financial tool for evaluating the performance, profitability, and financial position of an organization. The present study focuses on an analysis of the financial performance of Chaitanya Chemicals, Kadapa, through the application of ratio analysis. The main objective of the study is to assess the liquidity, solvency, profitability, and operational efficiency of the company using selected financial ratios. The study is based on secondary data obtained from the published financial statements of the company for a specified period. Key ratios such as current ratio, quick ratio, gross profit ratio, net profit ratio, debt–equity ratio, and turnover ratios are employed to analyze the financial health of the organization. The findings of the study reveal that ratio analysis provides meaningful insights into the company's financial strengths and weaknesses. While the company demonstrates a satisfactory liquidity position and stable profitability, certain efficiency ratios indicate the need for improved cost control and better utilization of assets. The study concludes that ratio analysis is an effective tool for managerial decision-making and financial planning. It also suggests that Chaitanya Chemicals can enhance its overall financial performance by strengthening operational efficiency, optimizing capital structure, and adopting strategic financial control measures.

Keywords Ratio Analysis, Financial Performance, Liquidity Ratios, Profitability Ratios, Solvency Ratios, Chemical Industry.

STUDY ON CASH FLOW ANALYSIS WITH REFERENCE TO CHAITANYACHEMICALS, KADAPA

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ABSTRACT

Cash flow analysis is a vital financial tool for assessing the liquidity position and cash management efficiency of an organization. The present study focuses on the cash flow performance of Chaitanya Chemicals, Kadapa, with emphasis on understanding the sources and applications of cash over a selected period. The study aims to evaluate the company's ability to generate cash from operating, investing, and financing activities, and to analyse its effectiveness in meeting both short-term and long-term financial obligations. The research is based on secondary data collected from the published financial statements of the company, and cash flow statements are analysed using comparative and trend analysis techniques. The findings reveal that operating activities constitute the major source of cash inflows, indicating sound operational performance. However, fluctuations in cash flows from investing and financing activities highlight the need for improved cash planning and more effective capital allocation strategies. The study concludes that efficient cash flow management is essential for maintaining liquidity and ensuring financial stability, and suggests strengthening cash forecasting practices and closely monitoring cash utilization to support sustainable growth and operational efficiency. The objectives of the study are to analyse the cash flow statements of Chaitanya Chemicals, Kadapa; However, variations in investment and financing cash flows suggest the need for improved financial planning and better cash management practices. Overall, the study emphasizes that effective cash flow management is crucial for maintaining liquidity, meeting financial obligations, and enhancing long-term financial sustainability.

Keywords Cash Flow Analysis, Liquidity Management, Operating Activities, Investing Activities, Financing Activities, Financial Performance.

AI-DRIVEN CONSUMER BEHAVIOR ANALYTICS: TRANSFORMING MARKETING STRATEGIES IN THE E-COMMERCE ERA

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ABSTRACT

The convergence of artificial intelligence and marketing analytics has revolutionized how organizations understand and predict consumer behavior in online marketplaces. This study examines the implementation of machine learning algorithms and predictive analytics in developing personalized marketing strategies that enhance customer engagement and conversion rates. Through sentiment analysis, natural language processing, and deep learning models, businesses can now decode complex consumer patterns and preferences with unprecedented accuracy. The research investigates how AI-powered recommendation engines, Chatbot's, and dynamic pricing algorithms create hyper-personalized customer experiences while optimizing marketing ROI. Furthermore, this study explores the integration of big data analytics and neural networks in segmenting target audiences and forecasting market trends. The findings reveal that organizations leveraging AI-driven marketing automation and predictive customer analytics achieve 35-40% higher customer retention rates compared to traditional approaches. However, challenges including data privacy concerns, algorithmic bias, and implementation costs remain significant barriers. This research contributes to the growing body of knowledge on technological transformation in marketing, providing actionable insights for marketers seeking competitive advantage through intelligent automation and data-driven decision-making frameworks in an increasingly algorithm-centric business landscape.

Keywords Artificial Intelligence, Consumer Behavior Analytics, Machine Learning, Predictive Analytics, E-Commerce Marketing, Sentiment Analysis, Natural Language Processing, Deep Learning, Marketing Automation, Big Data Analytics, Customer Retention, Data-Driven Marketing, Algorithm-Centric Marketing, Personalization Strategies, Marketing ROI.

A STUDY ON FUNDS FLOW ANALYSIS WITH REFERENCE TO CHAITANYA CHEMICALS, KADAPA

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ABSTRACT

Funds flow analysis is an important financial management tool used to evaluate the movement of funds and changes in the working capital position of an organization. The present study examines the funds flow position of Chaitanya Chemicals, Kadapa, with the objective of analyzing the sources and applications of funds during a selected period. The study focuses on understanding how effectively the company manages its long-term financial resources and utilizes funds for operational and investment purposes. The research is based on secondary data collected from the published financial statements of Chaitanya Chemicals. Funds flow statements are prepared and analyzed using comparative and analytical techniques to assess changes in working capital and overall financial stability. The findings reveal that the company's major sources of funds include funds from operations and long-term borrowings, while the application of funds is largely towards fixed asset acquisition and repayment of liabilities. The study highlights the role of efficient fund management in maintaining a balanced capital structure and financial soundness. The study concludes that funds flow analysis provides valuable insights into the long-term financial planning of the company. It suggests that Chaitanya Chemicals should strengthen its working capital management and adopt effective fund utilization strategies to ensure sustainable growth and improved financial performance.

Keywords Funds Flow Analysis, Working Capital, Sources and Applications of Funds, Financial Management, Long-Term Financial Planning.

A STUDY ON CUSTOMER LOYALTY AT MEGHANA RESTAURANT

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ABSTRACT

This study examines customer loyalty at Meghana Restaurant with the objective of understanding the factors that influence repeat patronage and long-term customer relationships. The research focuses on key elements such as food quality, service quality, pricing, ambience, and overall customer satisfaction. Data for the study is collected through structured questionnaires administered to customers of Meghana Restaurant. The findings aim to identify the level of customer loyalty and the relationship between customer satisfaction and loyalty. The study provides valuable insights for restaurant management to improve service strategies, enhance customer experience, and strengthen customer retention in a competitive food service industry.

Keywords Customer Loyalty, Customer Satisfaction, Service Quality, Restaurant Industry, Meghana Restaurant

FINTECH FRONTIERS: DECODING THE DIGITAL CORE FOR TRANSFORMATIVE IMPACT

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ABSTRACT

This conceptual manuscript explores the radical shift in financial management driven by the "Digital Core"—the foundational integration of AI, blockchain, and cloud-native architectures. It seeks to move beyond surface-level discussions of Fin Tech "apps" to investigate how the underlying infrastructure of finance is being re-engineered for greater efficiency and inclusivity. Adopting an exploratory, non-empirical approach, this study synthesizes current scholarship and multi-disciplinary literature. By analyzing recent trends in decentralized finance (De Fi), algorithmic governance, and real-time data analytics, the paper constructs a theoretical framework for understanding systemic transformation in the fiscal landscape. The analysis reveals that the transition to a digital core significantly reduces transactional friction, enhances predictive accuracy in risk management, and democratizes access to sophisticated financial instruments. This work contributes to the field by shifting the focus from "Fin Tech as a tool" to "Fin Tech as a foundational environment." Its novelty lies in the conceptualization of the "Digital Core" as a self-optimizing ecosystem rather than a static suite of technologies. The findings suggest that while these frontiers offer immense potential for value creation, they demand new regulatory paradigms and ethical guardrails. As a literature-based study, the primary limitation is the lack of primary empirical validation, which future longitudinal research should address.

Keywords Fin Tech Evolution, Digital Core, Decentralized Finance (DEFI), Financial Transformation, and Algorithmic Governance.

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

EXPLORING HISTORY: MONUMENT IDENTIFICATION AND VISUALIZATION USING DEEP LEARNING AND AUGMENTED REALITY

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ABSTRACT

Studying historical landmark detection and combining monument recognition with Augmented Reality (AR) presents an exciting yet challenging task in the field of image classification. The objective is to develop an Android-based application that blends the precision of deep learning with the immersive nature of AR, offering users an engaging and informative experience while exploring heritage sites. By training the model on a diverse dataset of monument images, the system is designed to perform reliable real-time detection and classification. This trained model acts as the core engine of the Android application, enabling users to simply point their device camera at a monument and instantly receive its identification along with detailed historical background. Users can capture live images through their mobile camera or select photos from their gallery. This immersive environment includes informative narratives about the monument, multimedia features such as live map locations, AR based visual representations, and 3D models that effectively recreate historical contexts. Overall, the integration of CNNs and AR not only improves the exploration of historical landmarks but also broadens access to cultural heritage by making it more engaging, educational, and widely accessible.

KeywordsDeep Learning, Convolutional Neural Networks (CNN), VGG16, SVM, LSTM, Augmented Reality.

AUTOMATED PARCEL DAMAGE DETECTION USINGCOMPUTER VISION AND DEEP LEARNING

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ABSTRACT

Parcel damage inspection is a key process in logistics and supply chain systems, as damaged shipments cause financial losses and reduce customer satisfaction. Existing inspection methods mainly rely on manual checking and traditional rule-based image processing, which are slow, inconsistent, and sensitive to changes in lighting and packaging conditions. To address these issues, this project proposes an automated parcel damage detection system based on computer vision and deep learning techniques. The system uses a Convolutional Neural Network (CNN) with the ResNet-34 architecture to automatically learn important features from parcel images and classify them as damaged or undamaged. ResNet-34, a deep residual network with skip connections, helps improve feature extraction, prevents gradient problems vanishing, and enhances classification accuracy. The system can identify visible damage types such as cracks, scratches, and deformation. Compared to conventional methods, the proposed system provides better accuracy, robustness, and scalability, making it suitable for real-time use in modern logistics and e-commerce environments.

KeywordsParcel Damage Detection, Computer Vision, Deep Learning, Convolutional Neural Network (CNN), ResNet-34, Image Classification.

VERIFYING BANK CHEQUES USING DEEP LEARNING AND IMAGE PROCESSING

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ABSTRACT

This innovative system transforms bank check verification by integrating deep learning, image processing, and a user-friendly Django-based web interface, streamlining the cheque truncation process with minimal human intervention. Leveraging the IDRBT cheque dataset, our convolutional neural network (CNN), implemented with PyTorch, achieves 99.14% accuracy in recognizing handwritten digits, as demonstrated in the base paper, while the source code employs adaptive thresholding and Gaussian blurring for robust image preprocessing. MATLAB's optical character recognition (OCR), with 97.7% accuracy, extracts machine-printed text such as IFSC codes and account numbers, complemented by Pytesseract in the code for region-based text extraction. Signature verification, powered by Scale Invariant Feature Transform (SIFT) and Support Vector Machine (SVM), attains 98.1% accuracy, with the code implementing SIFT feature extraction and SVM classification for real-time authenticity checks. The web interface enables users to upload cheque images, view datasets, train models, and receive instant classification results ("Genuine" or "Not Genuine"), enhancing accessibility. The system extracts critical details like cheque numbers, amounts, and signatures, adhering to CTS-2010 standards for Indian banks while supporting international formats. By automating verification, it reduces processing time, operational costs, and fraud risks, using contour detection and region-based analysis for precision. This scalable solution, combining the paper's rigorous methodology with the code's practical implementation, sets a new standard for secure, efficient financial transactions, with potential for multilingual and multi-format expansions.

Keywords Deep Learning, Image Processing, Convolutional Neural Network (CNN), Support Vector Machine, Optical Character Recognition, Bank Check Verification.

CONVOLUTIONAL NEURAL NETWORKS FOR NAIL DISEASE DETECTION: A PROMISING APPROACH FOR DERMATOLOGY

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ABSTRACT

The aim of this study is to use Deep Learning (DL) techniques to classify and detect human nail diseases. Early and reliable detection is crucial in aiding timely interventions and suitable treatment for nail diseases and their profound impact on a person's well-being. Using a diverse dataset of nail images, a CNN model was developed and trained to achieve the study's objectives. For the model to be able to accurately detect and classify different diseases, the dataset was carefully collected to include various types of nail diseases. In order to improve the model's performance and robustness, the nail images were pre-processed, and data augmentation techniques were applied. The model's assessment encompassed 6 distinct nail diseases, resulting in an impressive accuracy rate. Additional evaluation metrics such as precision, recall, and F1-score were also computed, yielding values of 99.22%, 98.44%, and 99.02% respectively. The achieved outcomes were compared with state of-the-art (SOTA) techniques, affirming the superiority of the proposed model. This study emphasizes the potential benefits of DL techniques in enhancing healthcare practices, enhancing dermatological diagnostics, and improving the overall well-being of patients suffering from nail diseases.

KeywordsNail Disease, Deep Learning, Nail abnormalities, Computer-aided diagnosis, Dermatology, Medical imaging, CNN.

SLEEP DISORDER IDENTIFICATION USING MACHINE LEARNING AND DEEP LEARNING MODELS

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ABSTRACT

Sleep disorders, including sleep apnea, significantly impact human health and overall quality of life. Accurate classification of sleep disorders is essential for effective diagnosis and treatment; however, manual sleep-stage classification by experts is often time-consuming and prone to error. This study explores the application of machine learning algorithms (MLAs) for sleep disorder classification using the publicly available Sleep Health and Lifestyle Dataset, which comprises 400 records and 13 features related to sleep and daily activities. Conventional MLAs such as k-nearest neighbours, support vector machines, decision trees, and random forests were compared with a deep learning approach based on artificial neural networks (ANN). To enhance model performance, a genetic algorithm was employed to optimise the parameters of each model. Experimental results revealed notable performance variations among the evaluated algorithms. The ANN model demonstrated superior classification capability compared to conventional machine learning methods, achieving strong precision, recall, and F1-score. These findings highlight the potential of optimised deep learning models, particularly ANN, in enabling reliable and efficient sleep disorder classification, thereby contributing to improved healthcare outcomes.

KeywordsMachine learning algorithms, deep learning, classification, genetic algorithm

REAL -TIME TRAFFIC FORECASTING AND OPTIMIZATION USING MACHINE LEARNING

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ABSTRACT

The exponential growth of urbanization and vehicular density has necessitated the evolution of intelligent systems to tackle road congestion and optimize traffic flow. Traditional traffic management systems often fail to adapt to dynamic and real-time changes, leading to inefficiencies and increased travel time. This system proposes a real-time traffic prediction and optimization framework using advanced machine learning algorithms to address this critical urban challenge. The model utilizes real-time traffic data which are then processed and fed into predictive models to anticipate traffic congestion and recommend optimal routing strategies. Algorithms such as Random Forest, Support Vector Machines, KNN and XGBoost are leveraged for their predictive accuracy and ability to learn complex patterns in traffic behavior. The system not only forecasts traffic conditions with high reliability but also assists in signal timing optimization and route planning, significantly improving traffic efficiency. The results demonstrate that machine learning can play a pivotal role in developing adaptive traffic systems that are scalable and robust, paving the way for smarter cities and sustainable urban mobility.

Keywords: Real-Time Traffic Prediction, Machine Learning, Predictive Modeling, Route Optimization, Traffic Congestion Reduction.

MACHINE LEARNING-BASED DETECTION OF LUMPY SKIN DISEASE IN CATTLE USING DEEP FEATURE EXTRACTION TECHNIQUES

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ABSTRACT

Lumpy skin disease (LSD) is a highly contagious viral infection that affects cattle and was first identified in Africa. It is currently spreading across the Middle East, Asia, and parts of Eastern Europe, causing serious concern due to its increasing prevalence and economic impact on the livestock industry. The disease is characterized by symptoms such as fever, excessive drooling, frequent tearing, enlarged lymph nodes, and the development of firm skin nodules. Diagnostic techniques including PCR testing, virus isolation, and histopathological analysis are commonly used for detection; however, these methods can be time-consuming, costly, and require laboratory facilities. Since cattle are vulnerable to many diseases, early and accurate diagnosis of LSD is essential to control its spread and reduce losses. The disease is caused by the Neethling virus and can result in irreversible skin damage, infertility, stunted growth, miscarriages, reduced milk production, and, in severe cases, death. To address these challenges, this study proposes an automated disease detection approach using deep learning models such as VGG-16, VGG-19, and Inception-V3 for effective feature extraction, combined with machine learning classifiers for accurate disease identification. Experimental results demonstrate that the proposed method achieves superior feature extraction and classification performance when compared with traditional techniques such as KNN, SVM, Naïve Bayes, ANN, and Logistic Regression, highlighting its potential for real-time and field-level disease monitoring.

Keywords: VGG16, VGG19, Inception V3, Image classification, Machine learning, Deep learning.

A DEEP LEARNING APPROACH FOR EARLY DETECTION OF ORAL CANCER

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ABSTRACT

This project aims to use deep learning techniques, especially the DenseNet architecture, to accurately detect oral cancer from tongue images. The dataset includes images of different oral conditions such as oral cancer, thrush, lichen, hairy tongue, leukoplakia, along with images of healthy tongues, collected from both affected patients and healthy individuals. A pre-trained DenseNet169 model, originally trained on the ImageNet dataset, was fine-tuned using transfer learning by adding new classification layers to suit the oral disease classification task. To make the model more robust and reliable, several data augmentation techniques were applied during training. The performance of the DenseNet-based model was compared with a LeNet model to evaluate its effectiveness. The results showed that DenseNet significantly outperformed LeNet, achieving an accuracy of 94.08%, precision of 94.16%, recall of 94.7%, and an F1 score of 94.7%. In contrast, the LeNet model showed lower performance, with values of around 64% across accuracy, precision, recall, and F1 score. This project highlights the importance of proper data preparation, careful model selection, and through evaluation in medical image analysis. Deep learning shows strong capability for early detection of oral cancer, and further fine-tuning along with validation in real clinical environments can enhance the model's effectiveness for practical application.

Keywords: Oral cancer, CNN, Deep learning image analysis, Dense Net, early detection, classification

ADVANCED OBJECT DETECTION IN REAL-TIME DRONE SURVEILLANCE USING DEEP LEARNING

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ABSTRACT

Deep learning algorithms, particularly convolutional neural networks (CNNs), have shown remarkable promise in improving the accuracy and efficiency of object detection in UAV-based remote sensing applications. These methods are capable of processing large volumes of aerial imagery in real time, which is crucial for tasks such as surveillance, monitoring, and disaster response. The review also explores the comparison between one-stage detectors, which offer faster processing speeds, and two-stage detectors, which provide higher accuracy but at the cost of speed. Further, the integration of deep learning with UAVs is assessed, focusing on hardware and software advancements that enable seamless real-time object detection. The paper concludes by highlighting challenges, such as computational limitations, and suggesting potential solutions to enhance performance in dynamic environments.

Keywords: YOLO, SSD, Feature Pyramid Networks (FPN), Transfer Learning

ANALYSIS AND PREDICTION OF UBER RIDE DEMANDUSING MACHINE LEARNING

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ABSTRACT

Accurately predicting ride demand is critical to improving Uber performance and increasing customer satisfaction. This project investigates machine learning methods to predict Uber ride requests by analyzing historical data including time, location, and other factors such as weather. After preprocessing and feature engineering, various models (linear regression, decision trees, random forests, and GBR) are evaluated for their prediction performance. GBR emerged as the best model, achieving over 99% accuracy due to its ability to handle complex data and capture nonlinear relationships. This study highlights the importance of physical and environmental features in improving prediction accuracy, allowing Uber to allocate drivers more efficiently and reduce passenger waiting times. These of ridings provide insight into demand forecasting, improved management, and service quality of ride hailing platforms. Keywords— Uber, ride demand forecasting, machine learning, forecasting, GBR, time series, previous data, infrastructure, distribution, impact of weather forecasting.

Keywords: Uber, ride demand forecasting, machine learning, forecasting, GBR, time series, previous data, infrastructure, distribution, impact of weather forecasting.

AN ML APPROACH FOR SOFTWARE DEFECT PREDICTION USING JM1 DATASET

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ABSTRACT

Ensuring software quality is critical for the effective and efficient development of complex software systems. Early identification and prediction of software defects play a vital role in reducing development cost and improving reliability. In this paper, we evaluate the performance of multiple machine learning techniques for software defect prediction using the NASA JM1 dataset. The models considered include Naïve Bayes, Decision Tree, Random Forest, Support Vector Machine, Logistic Regression, Artificial Neural Network, and K-Nearest Neighbors. Experimental results demonstrate that the Random Forest classifier outperforms other approaches, achieving the highest accuracy of 81%, along with superior precision, recall, and lower Root Mean Square Error (RMSE). The results emphasize the effectiveness of ensemble-based learning for early defect detection. A comparative analysis with existing studies further validates the robustness of the proposed approach. Finally, potential directions for future research are discussed to enhance defect prediction performance.

Keywords: Random Forest,Software bug prediction, Faults prediction, Prediction model, Machine learning, Software Quality, Defect Classification.

ALZHEIMER'S DISEASE PREDICTION USING SUPERVISED MACHINE LEARNING MODELS

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ABSTRACT

Alzheimer's disease prediction is a vital research area in healthcare due to its impact on memory, cognition, and quality of life. This project presents an efficient Alzheimer's disease prediction system using supervised machine learning techniques. Clinical and demographic parameters such as age, cholesterol levels, and other health indicators are analyzed to determine disease likelihood. Machine learning algorithms including K-Nearest Neighbour (KNN), Random Forest, Artificial Neural Networks (ANN), and Logistic Regression are employed for classification. Data preprocessing techniques such as normalization and feature selection are applied to enhance model performance. The system is evaluated using metrics such as accuracy, precision, recall, and F1-score. Experimental results show that KNN achieves the highest accuracy of 90%, followed by Random Forest with 89%, while ANN and Logistic Regression achieve 87%. The proposed approach supports early detection of Alzheimer's disease and assists healthcare professionals in informed decision-making.

Keywords: Machine Learning, Alzheimer's Disease Prediction, K-Nearest Neighbour (KNN), Artificial Neural Networks (ANN), Random Forest, Logistic Regression, Healthcare Analytics.

MACHINE LEARNING AND DEEP LEARNING BASED APPROACH FOR ANALYZING HEARTBEAT SOUNDS

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ABSTRACT

Machine learning and Deep learning has been growing rapidly in multiple domains especially in the domain of healthcare. Heart diseases remain one of the leading causes of death worldwide, making early and accurate detection essential for improving patient outcomes. This work focuses on the automatic classification of heartbeat sounds using machine learning and deep learning–based approaches. Different feature extraction techniques are analyzed to study their impact on classification performance. For this purpose, three types of features are considered: traditional audio signal processing features, deep learning features extracted from pre-trained models, and a hybrid combination of both audio and deep learning features. The extracted features are classified using Support Vector Machine (SVM), Random Forest, and XGBoost classifiers. To handle the high-dimensional feature space, Principal Component Analysis (PCA) is applied for dimensionality reduction. Furthermore, feature concatenation and majority voting techniques are employed to improve classification accuracy and system robustness. Experimental results demonstrate that the hybrid feature approach achieves improved performance compared to individual feature sets, highlighting the effectiveness of integrating machine learning and deep learning techniques for heartbeat sound analysis. This study demonstrates the potential of automated heartbeat sound classification as a reliable tool for early cardiac disease diagnosis in healthcare applications.

Keywords: Heart Sound Classification, Spectrogram Analysis, Machine Learning, Feature Engineering, Support Vector Machine, Deep Learning, Transfer Learning.

MACHINE LEARNING–BASED PREDICTION OF DIGITAL PAYMENT ADOPTION AMONG RETAIL VENDORS

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ABSTRACT

The adoption of digital payment platforms by retail vendors has become a pivotal transformation in India's payment landscape. This project utilizes machine learning techniques to predict whether a retail vendor is likely to adopt digital payment systems such as Paytm, Google Pay, PhonePe, and Amazon Pay. Data was collected from 270 merchants across 10 major retail markets in Bangalore, targeting both organized and unorganized sectors. Through a comprehensive analytical approach involving descriptive statistics, exploratory factor analysis (EFA), and Support Vector Machine (SVM) modeling, the system identifies core factors influencing adoption: perceived usefulness, social influence, and compatibility. Additionally, the system evaluates customer satisfaction across platforms and forecasts future digital payment adoption trends using the ARIMA time series model. This integrated platform consists of three major modules: user (vendor interaction), admin (data management and analysis), and machine learning (prediction and forecasting). The system not only aids in understanding the behavior of retail vendors but also empowers policymakers, fintech providers, and entrepreneurs with actionable insights to improve the digital payments ecosystem.

Keywords: Support Vector Machine (SVM), ARIMA, Exploratory Factor Analysis (EFA)

AUTOMATED AI-POWERED FRUIT IDENTIFICATION USING CONVOLUTIONAL NEURAL NETWORK

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ABSTRACT

AI-Driven Automated Fruit Identification Using Convolutional Neural Networks presents an intelligent system that analyzes fruit images and accurately identifies different fruit types using artificial intelligence and deep learning techniques. The system is trained on a large collection of fruit images, enabling the model to learn visual patterns and distinguish similarities and differences. among fruits based on features such as color, shape, size, and texture. The application is clearly defined using the PEAS framework and the six dimensions of the task environment to describe the intelligent agent and its operating conditions. Pattern recognition techniques are integrated with a Convolutional Neural Network (CNN) to overcome challenges caused by variations in lighting, background, orientation, and image quality. Experimental results show that the CNN algorithm outperforms traditional support vector machine–based approaches using handcrafted features, offering higher accuracy and faster adaptability to new fruit categories. The proposed system achieves an accuracy of 84%, demonstrating its effectiveness and reliability. The primary objective of this project is to develop a fast and accurate fruit identification tool with practical applications in automated fruit sorting, retail systems, and educational platforms, while highlighting the potential of AI-driven computer vision systems to interact intelligently with the real world

Keywords: Fingerprint patterns, Deep learning, Pattern recognition, fruit detection, computervision, machine learning, Convolutional Neural Networks.

CREDIT CARD FRAUD ANALYSIS USING MACHINE LEARNING MODELS

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ABSTRACT

With the rapid growth of digital financial services, fraudulent credit card transactions have become a major concern in the banking and finance sector. Traditional rule-based fraud detection systems are no longer efficient due to the increasing complexity and large volume of transaction data. As digital payments and cashless transactions are widely encouraged, the risk of fraud has also increased. Many users remain unaware of how their card details can be misused by attackers to perform unauthorized transactions, leading to significant financial losses every year. To address this issue, machine learning techniques provide an effective solution by analyzing transaction patterns and identifying suspicious activities in real time. These intelligent models improve fraud detection accuracy and assist financial institutions in minimizing losses while enhancing customer security.

Keywords: Credit Card Fraud, Fraud Detection, Machine Learning, Digital Payments, Financial Security, Online Transactions.

SPEECH BASED AGE AND GENDER CLASSIFICATION USING DEEP NEURAL NETWORKS

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ABSTRACT

This paper presents a deep learning–based approach for predicting the age and gender of a speaker using speech signals. A comparative analysis is performed using logistic regression and long short-term memory (LSTM) networks for gender classification. For age prediction, a hybrid model combining K-means clustering with logistic regression is employed. Experimental results indicate that the LSTM model achieves superior performance compared to logistic regression in gender classification. In addition, the hybrid approach effectively categorizes speakers into different age groups. The proposed methodology demonstrates potential applicability in real-world domains such as virtual assistants, speech-based systems, and healthcare applications.

Keywords: Deep learning, LSTM, logistic regression, K-means clustering, machine learning, age prediction, gender prediction

FETAL HEALTH CLASSIFICATION USING OPTIMIZED ENSEMBLE MACHINE LEARNING TECHNIQUES

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ABSTRACT

Maternal and fetal mortality remain major healthcare challenges, highlighting the need for accurate fetal health assessment. Cardiotocography (CTG) is a non-invasive technique used to monitor fetal heart rate and uterine contractions; however, conventional clinician-driven interpretation is subjective and prone to errors, especially when data availability is limited.
This study uses machine learning techniques to classify fetal health using a small CTG dataset. Ensemble learning methods such as blending and stacking are applied to improve accuracy when data is limited. The results show that ensemble models perform better than individual classifiers, proving the usefulness of automated fetal health classification in data-constrained settings.

Keywords: Cardiotocography (CTG), Fetal Health Prediction, Machine Learning, Decision Tree, K-Nearest Neighbors (KNN), Logistic Regression,Naïve Bayes Theorem, Support Vector Machine.

DETECTION OF SUBMERGED NAVAL MINES USING SONAR FREQUENCY DATA AND MACHINE LEARNING

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ABSTRACT

In modern naval defense operations, submarines play a crucial role but significant threats from submerged naval mines capable of causing severe damage. Sonar systems are commonly employed to detect under water objects by analyzing reflected acoustic frequency signals; however, reliably distinguishing navel mines from natural objects such as rocks remains a challenging task due to environmental variability and signal noise. This project presents a machine-learning-based approach for submerged naval mine detection using sonar frequency data. Existing systems often rely on complex ensemble-based models that achieve high accuracy but suffer from increased computational complexity and reduced suitability real-time deployment. To address these limitations, the proposed system employs a random forest classifier-based classification model that focuses on dominant sonar frequency features to achieve fast, interpretable, and stable detection performance. A real-world sonar data set is used for training and evolution, and performance of the proposed models is analyzed in comparison with ensemble-based approaches. Experimental results indicate that the proposed method provides reliable mine-rock classification with reduced false alarms and improved real-time applicability, supporting safer and more efficient underwater naval operations.

Keywords: Submerged Naval Mine Detection, Five-Frequency SONAR Features, Threshold Based Classification, Linear Regression Model, Real-Time Underwater Detection.

DATA-DRIVEN APPROACH TO EMPLOYEE ATTRITION PREDICTION USING MACHINE LEARNING

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ABSTRACT

The increasing adoption of machine learning techniques by organizational decision-makers has encouraged researchers to investigate their applicability in addressing critical workforce challenges. Employee attrition, particularly the loss of skilled and experienced personnel, remains a significant concern for modern organizations. This study examines the effectiveness of machine learning models in predicting employee attrition using a synthetic dataset provided by IBM Watson. Three experimental scenarios were designed to evaluate model performance. In the first scenario, machine learning algorithms—Support Vector Machine (with multiple kernel functions), Random Forest, and K-Nearest Neighbors—were trained on the original class-imbalanced dataset. The second scenario addressed class imbalance through the Adaptive Synthetic Sampling (ADASYN) technique, followed by retraining the same models on the balanced data. The third scenario applied manual under sampling to achieve class balance. Experimental results indicate that the ADASYN-balanced dataset combined with the K-Nearest Neighbors algorithm produced the best performance, achieving an F1-score. Additionally, feature selection techniques integrated with the Random Forest model yielded an F1-score while reducing the feature set from the attributes. The findings demonstrate the importance of data balancing and feature optimization in enhancing employee attrition prediction.

Keywords: Machine Learning, Support Vector Machine (SVM), Random Forest, KKN, Feature ranking, Feature Selection.

MACHINE LEARNING TECHNIQUES FOR IDENTIFYING PHISHING WEBSITES

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ABSTRACT

Phishing attacks remain one of the most prevalent cybersecurity threats, where attackers create fake websites to steal sensitive user information such as login credentials and financial data. Traditional phishing detection methods rely on manual inspection or static feature-based machine learning models, which often fail to detect new or evolving phishing patterns. This project proposes a robust machine learning-based phishing website detection system that leverages an enhanced feature set, including URL characteristics, domain information (such as age, SSL certificate, and registration details), and optional webpage content features. The system employs an ensemble of Random Forest and XGBoost classifiers, with Logistic Regression as a baseline, to achieve high detection accuracy. Additionally, explainable AI techniques (SHAP/LIME) are integrated to provide transparency and interpretability in the detection process. Designed for real-time URL analysis, the system aims to reduce false positives, improve adaptability to new phishing strategies, and provide trustworthy results.

Keywords: Phishing Detection, Machine Learning, Random Forest, XGBoost, URL Analysis.

CATARCT DISEASES IN RETINAL IMAGES USING VISION TRANSFORMER ARCHITECTURE

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ABSTRACT

The eye is one of the most important sensory organs in humans, and diseases affecting the retina can significantly impact vision and quality of life. Cataract is a common eye disorder that causes clouding of the eye lens and may lead to vision impairment if not detected early. With the rapid advancement of medical imaging and artificial intelligence, automated techniques have become essential for assisting in the early diagnosis of eye diseases. This project focuses on the classification of cataract disease using retinal images through a deep learning–based approach. A Vision Transformer (ViT) model is employed to analyze retinal images by leveraging self-attention mechanisms that effectively capture global contextual relationships between image regions. Unlike conventional Convolutional Neural Networks (CNNs), the Vision Transformer processes image patches directly, enabling improved modelling of long-range dependencies. Multiple experimental scenarios are explored by varying hyperparameters such as epochs, optimizers, learning rates, and input image dimensions to enhance the robustness of the system. The proposed approach aims to provide a fast, reliable, and efficient solution for automated cataract detection, supporting healthcare professionals in early diagnosis and clinical decision-making.

Keywords: Cataract Detection, Retinal Image Classification, Vision Transformer, Deep Learning, Medical Image Analysis

TEXT-TO-IMAGE GENERATION FOR ENHANCED WEB UI DEVELOPMENT

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ABSTRACT

The design of effective web user interfaces (UI) traditionally depends on professional designers or pre-built image resources, which increases development time and cost. This project presents a text-to-image generation–based system for enhanced web UI development that automates the creation of visual content using deep learning techniques. The proposed system employs a pre-trained Stable Diffusion model to generate high-quality images from user-provided textual descriptions. Secure user authentication and administrative modules are incorporated to manage system access and functionality. The system is capable of generating multiple visual styles, including photorealistic and cinematic images, Alegria-style illustrations, and black silhouette icon-style graphics, making it suitable for diverse web UI requirements. Experimental evaluation demonstrates that the automated image generation process significantly reduces manual design effort, frontend development time, and reliance on external image repositories. The results confirm that text-to-image generation is an effective and scalable approach for improving efficiency, flexibility, and visual quality in modern web UI development.

Keywords: Text-to-Image Generation, Diffusion Models, Stable Diffusion, Usability Interface (UI), Web Development, Automated Image Generation, Generative AI.

RECOGNITION OF SARCASM IN NEWS HEADLINES USING ADVANCED LEARNING TECHNIQUES

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ABSTRACT

Sarcasm is a way of saying something where the actual meaning is different from the words used, often to express humor or criticism. Automatically detecting sarcasm is useful in tasks like sentiment analysis and opinion mining. However, sarcasm detection in news headlines is difficult because headlines are short and do not provide much context. This work focuses on detecting sarcasm in news headlines using XGBoost as the main model, while CNN and BiLSTM are used for comparison. CNN helps in identifying important word patterns, and BiLSTM understands the context of a sentence from both directions. The results show that using both machine learning and deep learning models together improves sarcasm detection accuracy. Text preprocessing and feature extraction also help in improving the performance. The proposed method can be used in real-world applications such as media analysis, fake news detection, and monitoring public opinions.

Keywords: Sarcasm Detection, News Headlines, Machine Learning, Deep Learning.

EMOTION IDENTIFICATION FROM SPEECH SIGNALS USING MACHINE LEARNING TECHNIQUES

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ABSTRACT

Speech Emotion Recognition (SER) is an important area of research that aims to identify human emotions from speech signals to improve human– computer interaction. Traditional SER systems mainly depend on handcrafted acoustic features such as pitch, energy, and Mel-Frequency Cepstral Coefficients (MFCCs) along with conventional machine learning classifiers. Although these systems can recognize basic emotions, they face challenges in handling complex emotional patterns, temporal variations, background noise, and speaker differences, resulting in limited accuracy and poor generalization in real-world conditions. To overcome these limitations, this project proposes an advanced Speech Emotion Recognition system using deep learning and machine learning techniques. The proposed approach incorporates effective preprocessing methods such as noise reduction and normalization, followed by robust feature extraction techniques including MFCCs, chroma features, and spectral contrast. Deep learning models such as Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM) networks are employed to automatically learn discriminative features and capture both spatial and temporal characteristics of speech signals. Support Vector Machines (SVM) are also used for efficient emotion classification. Experimental results demonstrate that the proposed system achieves higher accuracy, improved robustness, and better scalability compared to traditional methods. This system is well suited for real-world applications such as virtual assistants, customer support systems, and mental health monitoring

Keywords: Machine Learning, Deep Learning, Mel-Frequency Cepstral Coefficients, Convolutional Neural Networks, Long Short-Term Memory, Support Vector Machines, Human–Computer Interaction

RESIDUAL CNN-BASED AUDIO CLASSIFICATION OF EMERGENCY SIRENS FOR SMART TRAFFIC CONTROL

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ABSTRACT

Emergency vehicle sound classification is an important component of intelligent traffic management systems, as it helps reduce delays for emergency services during critical situations. This project proposes a method for detecting and classifying emergency vehicle siren sounds using Residual Convolutional Neural Networks (CNNs). The system utilizes a dataset of WAV audio files containing siren sounds from ambulances, fire trucks, and police vehicles. Mel-Frequency Cepstral Coefficients (MFCCs) are extracted as key audio features to capture the unique frequency patterns of emergency sirens. Audio signal processing techniques, including noise reduction and feature normalization, are applied during preprocessing to improve model performance. The extracted MFCC features are then used to train a residual CNN model capable of accurately classifying the siren sounds into their respective categories. Experimental results show that the proposed model achieves high classification accuracy, demonstrating its reliability for real-time applications. By integrating the classification system with dynamic traffic signal control, traffic lights can be automatically adjusted to provide priority access to approaching emergency vehicles. This approach enhances overall traffic efficiency and reduces emergency response time. The proposed system shows strong potential for deployment in smart city environments. In the future, the system can be combined with live traffic data to further improve traffic management in cities.

Keywords: Emergency vehicle sound classification, residual convolutional neuralnetworks (CNN), mel-frequency cepstral coefficients (MFCC), intelligent traffic management, dynamic trafficsignalcontrol,audiosignalprocessing.

RESILIENT TRAFFIC SIGNAL TIME CONTROLLER FOR TRAFFIC MANAGEMENT USING ARTIFICIAL INTELLIGENCE

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ABSTRACT

Traffic congestion has become a major issue in modern cities because of rapid urban growth and the rising number of vehicles. This results in longer travel times, higher fuel use, and more environmental pollution. Traditional traffic signal control systems work on fixed schedules and don't respond well to real-time traffic conditions, leading to poor traffic flow. This paper introduces a strong and adaptable traffic signal control system using artificial intelligence and computer vision techniques. The proposed system analyzes video streams from CCTV cameras at traffic intersections to detect vehicles, measure traffic density, and adjust signal timings dynamically for better traffic flow. It also features emergency vehicle detection and prioritization, ensuring that vehicles like ambulances and fire trucks get immediate right-of-way by changing signal phases automatically. Additionally, the system includes a human machine interaction feature that allows authorized personnel to take control of traffic signals using hand gestures during emergencies, unusual traffic situations, or system failures. By combining smart vehicle detection, flexible signal control, emergency prioritization, and manual management, this system improves flexibility, reliability, and responsiveness. The goal is to cut down on vehicle waiting times, fuel use, and emissions while offering a scalable and affordable solution for smart urban traffic management systems.

Keywords: Adaptive Traffic Control, Vehicle Detection, Emergency Vehicle Prioritization, Artificial Intelligence, Computer Vision, Hand Gesture Recognition, Intelligent Transportation Systems.

DEEP LEARNING-BASED ROAD DAMAGE IDENTIFICATION USING UNMANNED AERIAL VEHICLE IMAGES

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ABSTRACT

The transport infrastructure, especially roads, is of great importance in making transport safe and efficient. Nevertheless, the conventional road damage monitoring procedure can be time-consuming and needs to be done manually. The paper will suggest a smart road damage detention system with the help of deep learning and computer vision methods. The suggested system can be designed to identify and tag various forms of road damages including longitudinal cracks, transverse cracks, alligator cracks, and potholes amongst other surface damages. The web-based inspection system is developed based on Django framework that enables a user to submit an image of the road or conduct a road inspection in real time with the help of a live camera. The result of the experimentation process indicates that the developed system can indeed measure damages on roads very efficiently and effectively and this is quite useful in road inspection in real-time in the application of smart city surveillance.

Keywords: Road damage detection, Crack classification, YOLOv8, Computer vision, Deep learning, Real-time monitoring, Web-based inspection, Smart infrastructure.

COMPARATIVESTUDYOF AUTOMATED TECHNIQUESFOR MULTILABEL SKIN CANCER CLASSIFICATION

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ABSTRACT

Skin cancer is one of the most common and dangerous diseases because many people are unaware of its signs and prevention methods. It ranks as the fourth most burdensome disease worldwide, with death rates increasing significantly. Early detection is crucial to stop the spread of cancer. This paper detects and classifies multi-label skin cancer and implements the best techniques using machine learning and image processing. Preprocessing methods help remove irrelevant and unnecessary features from the label encoder, and standard features are used to standardize the range of functionality by scaling the input variance unit. Additionally, various machine learning techniques were tested to evaluate the performance of each classifier on the HAM10000_metadata dataset. The experimental analysis focused on the HAM10000_metadata dataset, which includes seven different types of skin cancer. The results indicate that machine learning algorithms such as SVM, DT, and GNB achieved the highest accuracy compared to the other classifiers.

Keywords: Skin Cancer, Machine Learning, Deep Learning, CNN, ResNet, DenseNet, Multi-Label Classification, Medical Image.

TRUSTWORTHY AND EXPLAINABLE ARTIFICIAL INTELLIGENCE FOR REAL-WORLD APPLICATIONS.

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ABSTRACT

Artificial Intelligence (AI) systems are increasingly being deployed in critical real-world applications such as healthcare, finance, transportation, cybersecurity, and smart infrastructure, where reliability, transparency, and accountability are essential. Traditional AI models, particularly deep learning approaches, often achieve high accuracy but operate as "black boxes," making their decisions difficult to interpret and trust. This paper presents an overview of trustworthy and explainable artificial intelligence (XAI), focusing on techniques that improve model transparency, interpretability, fairness, and robustness without significantly compromising performance. The study discusses various approaches used to enhance trust in AI systems, including model-agnostic explanation methods, interpretable model design, bias detection mechanisms, and uncertainty estimation techniques. In addition, the role of data quality, ethical considerations, and secure deployment practices in building reliable AI solutions is examined. Emerging trends such as human-in-the-loop learning, federated learning, and edge-based AI are also explored, as they contribute to privacy preservation, improved system reliability, and scalable real-time decision-making. Despite rapid progress, several challenges remain, including balancing model complexity with interpretability, ensuring fairness across diverse datasets, and developing standardized evaluation metrics for explainability and trustworthiness. Future research directions include lightweight and transparent models, robust validation frameworks, and improved collaboration between humans and intelligent systems to ensure responsible AI adoption. Overall, this study provides a structured overview of current advancements in trustworthy and explainable AI and highlights their importance in enabling safe, reliable, and transparent intelligent systems for real-world applications.

Keywords: Explainable AI, Trustworthy Artificial Intelligence, Machine Learning, Model Interpretability, Responsible AI, Fairness, Robustness, Real-World Applications

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

HYBRID MACHINE LEARNING AND DEEP LEARNING FRAMEWORK FO CROSS-CHEMISTRY SOH ESTIMATION IN ELECTRIC VEHICLE BATTERIES

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ABSTRACT

Accurate real-time State of Health (SOH) estimation is crucial for the safe and efficient operation of electric vehicle (EV) batteries across different chemistries. Traditional Battery Management System (BMS) methods struggle to generalize due to nonlinear and time-dependent battery degradation. This project proposes a real-time BMS-based SOH prediction framework with cross-chemistry validation, enabling SOH estimation across multiple lithium-ionbatteries such as LFP,NMC, Solid State ,LCO. The framework integrates Machine Learning (ML) and Deep Learning (DL) approaches and evaluates their performance to enable adaptive selection between them. An ensemble ML regression model based on Histogram Gradient Boosting(HGB) provides efficient real-time prediction using key BMS parameters, while DL models based on Long Short-Term Memory (LSTM) networks and Generative Adversarial Networks (GANs) capture complex temporal degradation patterns and improve generalization. Validation on battery datasets demonstrates that the ML model offers faster estimation, whereas the DL model achieves higher accuracy and robustness across battery chemistries, making the system suitable for next-generation EV BMS applications.

Keywords: BMS, Histogram Gradient Boosting, LSTM, GAN, LFP, NMC, Solid State, LCO.

MACHINE LEARNING TECHNIQUES FOR ANALYZING ONLINE CUSTOMER PURCHASE DECISIONS

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ABSTRACT

The rapid growth of e-commerce platforms has generated massive volumes of user interaction data, creating new opportunities to analyze and predict consumer purchasing behavior. Accurately identifying whether a customer is likely to purchase a product is crucial for improving personalized marketing strategies, inventory management, and overall user experience. This project proposes a machine learning–based approach for predicting customers' purchasing decisions by analyzing historical user behavior and product-related features. The proposed system includes data preprocessing, feature selection, and the application of classification algorithms to distinguish between purchase and non-purchase instances. Exploratory data analysis is conducted to uncover significant patterns and relationships within the dataset. The trained models are evaluated using standard performance metrics such as accuracy, precision, recall, and F1-score to ensure reliable prediction performance. The experimental results demonstrate that machine learning techniques can effectively capture complex consumer behavior patterns and provide accurate purchase predictions. This approach can assist e- commerce platforms in making data-driven decisions, enhancing recommendation strategies, and improving customer engagement and sales performance.

Keywords: E-commerce, Customer Purchase Prediction,Machine Learning, Classification, Consumer Behavior, Data Mining, Predictive Analytics, User Behavior Analysis

IMMERSIVE LEARNING EXPERIENCE AND PERSONALIZED LEARNING PATHWAYS THROUGH AI TECHNOLOGY

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Abstract

The rapid advancement of artificial intelligence (AI) creates revolutionary opportunities in education by enabling highly customized and immersive learning environments. This study explores the application of AI technology in schools to offer adaptable, engaging, and educational pathways. Through gamification, virtual and augmented reality, and AI-powered simulations, immersive experiences aim to increase student comprehension and engagement in a range of subjects, including STEM and the humanities. Using AI algorithms and machine learning models, this project seeks to design and implement personalized learning pathways according to each learner's needs, preferences, and stage of development. These pathways continuously adapt to users' cognitive abilities, learning preferences, and mental health in order to optimize academic achievement and encourage lifelong learning. The research also investigates the ethical implications, scalability, and effectiveness of such AI-powered systems in diverse educational contexts, ranging from K-12 classrooms to higher education and professional training. The outcomes of this study aim to establish a robust framework for AI-driven immersive education, addressing challenges like equity, accessibility, and data privacy, while redefining the role of educators and institutions in the age of intelligent learning technologies. This research aspires to contribute significantly to the pedagogical shift towards a more inclusive, interactive, and personalized future of education.

Keywords:virtual reality, augmented reality, immersive learning, adaptive learning system, AI driven simulations, Cognitive and Emotional Adaptation, K-12 and Higher Education

MULTIMODEL FRAMEWORK FOR DETECTION AND PREDICTION OF FUTURE MENTAL DISORDER FROM SOCIAL MEDIA DATA

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ABSTRACT

Social media platforms are widely used by people across the globe to express their feelings, opinions, and emotional states. Billions of users actively share their thoughts through daily posts, creating vast amounts of textual data that reflect psychological behavior. Among the various social media platforms, Facebook alone hosts nearly three billion personal accounts, highlighting the scale of user-generated content. In this study, a Reddit dataset is utilized to automatically detect mental illness from social media posts. Unlike traditional approaches, this work is not limited to identifying existing mental disorders such as depression and anxiety, but is further extended to predict potential future mental illness based on users' social media activity. To achieve this, nineteen different models are deployed to evaluate their effectiveness in detecting and predicting mental disorders from social media text. These models include six classical machine learning classifiers, nine ensemble learning techniques, and four large language models (LLMs). Logistic regression emerged as the best-performing classical classifier, while ensemble models such as voting classifier (VC2), LightGBM, Bagging Estimator, and XGBoost T outperformed other models. All models were trained, tested, and compared with existing literature, addressing four major mental disorders: ADHD, Anxiety, Bipolar Disorder, and Depression. The proposed approach outperformed previous studies in terms of the number of disorders covered, model diversity, and dataset size, achieving F1-scores of 0.80 on clinical data and 0.52 on non-clinical data for detection, and an F1-score of 0.43 for future mental illness prediction using non-clinical data.

Keywords: Social Media Data, Mental Health Detection, Mental Disorder Prediction, Reddit Dataset, Machine Learning, Ensemble Learning, Large Language Models, Depression, Anxiety, Bipolar Disorder, ADHD, Future Mental Illness Prediction

EARLY DETECTION OF GLAUCOMA FROM FUNDUS IMAGES USING DEEP NEURAL NETWORKS

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ABSTRACT

Glaucoma is a progressive ocular disease that causes irreversible vision loss due to optic nerve damage, making early diagnosis essential. This paper proposes a deep learning–based framework for automated glaucoma detection using retinal fundus images through accurate optic disc and optic cup segmentation. The system employs EfficientNet-B0 as a convolutional backbone to extract discriminative features from preprocessed images. A patch-based U-Net architecture is utilized to perform pixel-level segmentation of optic disc and optic cup regions while reducing computational complexity. An auxiliary disc localization task is incorporated to guide the segmentation network toward disc-relevant regions, thereby improving segmentation accuracy. Segmented patches are aggregated to reconstruct complete segmentation masks. The Cup-to-Disc Ratio, a clinically significant indicator, is computed from the segmented regions and used to classify images as glaucomatous or non-glaucomatous. Experimental evaluations demonstrate that the proposed modular framework achieves reliable detection performance and is suitable for efficient clinical screening applications.

Keywords : Glaucoma Detection, Fundus Images, U-Net, EfficientNet, Auxiliary Disc Localization, Cup- to-Disc Ratio

LEVERAGING A HYBRID CNN–LSTM MODEL FOR AUTOMATED BUG LABELING AND ASSIGNMENT IN OPEN- SOURCE SOFTWARE PROJECTS

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ABSTRACT

Bug triaging means checking each software bug report and sending it to the right developer. In big open-source projects, thousands of bug reports come every day, this processing takes a lot of time. Machine Learning helps by reading bug reports automatically and predicting the correct label and developer. This makes the bug- fixing process faster and reduces mistakes caused by humans. This approach uses smart algorithms to understand text, patterns, and developer history. Overall, this work aims to make bug triaging quicker, more accurate, and more helpful for developers in large communities. Currently, bug triaging in many open-source projects is done manually by maintainers. Some traditional systems use simple text matching or basic machine learning models. These methods struggle when the dataset is large, complex, or contains noisy information. Models also face problems like incorrect labels, missing data, and difficulty understanding long sentences. prior approaches such as Naive Bayes, SVM or similarity-based models and basic classifiers give average accuracy only.Due to this, bugs are often mis-assigned, delayed, or reopened, reducing overall project efficiency. So, current system accuracy≈ 50%–55% (average performance). The intended system uses advanced machine learning models like CNN, Random Forest, and Naive Bayes.These models read the bug report text deeply and learn important patterns automatically.They also use data augmentation and hyperparameter tuning to improve accuracy. The system predicts both the correct bug labels and the right developer who should fix the issue. This reduces triaging time, avoids human mistakes, and manages large datasets easily. Suggestd approach is fast, scalable, and smarter solution for automating bug triaging.

Keywords: CNN-LSTM hybrid model, Bidirectional lstm, Multinomial navie bayes

STUDENT RETENTION PREDICTION USING NEURAL NETWORKS

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ABSTRACT

The persistent sub-replacement fertility rate in Taiwan has led to a continuous decline in student enrollment, posing serious operational and financial challenges for higher education institutions. As a result, issues related to student suspension and dropout have become increasingly critical, threatening institutional sustainability and academic performance. In this context, early identification of students who are at risk of suspension or withdrawal is essential for enabling timely interventions and ensuring effective student retention.To address this challenge, this study proposes the use of a Multilayer Perceptron (MLP)–based predictive model to identify students with a high likelihood of suspension or dropout. The primary objective of this approach is to support educational institutions in proactively monitoring student academic behavior and engagement patterns, thereby enabling counseling units to intervene before academic disengagement becomes irreversible. By leveraging predictive analytics, institutions can allocate counseling and support resources more precisely, reducing inefficiencies and enhancing the overall effectiveness of intervention strategies. The dataset utilized in this research consists of comprehensive student academic and administrative records collected from Chaoyang University of Technology over five academic years, spanning from 2017 to 2021. To ensure robust model evaluation, data from the second semester of the 2021 academic year were reserved exclusively for testing, while records from the remaining nine semesters were used for training and validation. This temporal data partitioning reflects real-world deployment conditions, where historical data are used to predict future student outcomes.Experimental results indicate that the proposed MLP model achieved an accuracy of 81.70% in predicting student suspension and dropout, demonstrating its strong potential as a reliable decision-support tool. These findings suggest that machine learning–based approaches can effectively capture complex patterns within educational data that may not be easily detected through traditional analytical methods. Future research will focus on further optimizing the model by incorporating additional behavioral and psychological features, exploring advanced neural architectures, and deploying the system in real-world educational environments. Ultimately, such a system could play a crucial role in guiding counseling resource allocation, improving student retention, and supporting strategic decision-making at the institutional level.

ASSESSING DRIVING RISK LEVEL: HARNESSING DEEP LEARNING HYBRID MODEL WITH INTERCITY BUSNATURALISTIC DRIVING DATA

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ABSTRACT

Driving risk assessment is crucial for enhancing traffic safety, especially given the severe consequences of highway accidents. This study advances the field by developing a deep learning hybrid model for time series analysis to categorize driving risks into low, moderate, and high levels. By collecting naturalistic driving data from intercity buses, the model is trained on an extensive dataset featuring 27,057 journey-based instances, incorporating dynamic GPS data and static journey background information from over 300 drivers. The model's effectiveness is highlighted by its outstanding weighted average F1-score of 0.932, indicating exceptional robustness and predictive accuracy. Through comprehensive feature engineering and examinations of three temporal neural models, this research identifies the best parameter configurations. The key finding is that including static journey background information leads to improvements by 8.8% on average in model performance. Additionally, the high-risk level prediction F1- score reaches 0.728 for the proposed model, which is up to 9.3 times better than the performance of the machine learning baseline model. This breakthrough in driving risk prediction not only represents a major advancement in traffic safety management but also has practical implications for fleet scheduling management among transportation companies in the future. By applying this model, companies can enhance passenger safety and comfort, showcasing the significant potential of deep learning in real-world applications.

Keywords: Driving risk assessment, high-risk driving level predictor, naturalistic driving data, deep learning hybrid model, static journey background information.

SMART AGRICULTURE: CROP PREDICTION AND RECOMMENDATION USING ARTIFICIAL NEURAL NETWORKS (ANN)

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ABSTRACT

Agriculture plays a vital role in the economic growth of many countries, and selecting an appropriate crop is a crucial decision that directly impacts productivity and profitability. Traditional crop selection methods often depend on farmer experience and may not fully consider complex environmental factors. This paper presents a Crop Prediction and Recommendation System based on machine learning techniques to support data-driven agricultural decision-making. The proposed system utilizes soil parameters such as nitrogen, phosphorus, potassium, pH value, along with climatic factors including temperature, rainfall, and humidity. Multiple machine learning algorithms—Decision Tree, Random Forest, Naïve Bayes, Support Vector Machine (SVM), and K- Nearest Neighbors (KNN)—are implemented and evaluated to predict the most suitable crop for a given set of conditions. Among these, ensemble-based models demonstrate higher accuracy and robustness. Based on the predicted crop, the system provides recommendations to enhance yield and minimize risk. Experimental results show that the proposed system improves crop selection accuracy, promotes efficient resource utilization, and contributes to sustainable and precision agriculture.

Keywords:Crop Prediction, Crop Recommendation System, Precision Agriculture, Machine Learning, Decision Tree, Random Forest, Support Vector Machine, K-Nearest Neighbors, Naïve Bayes, Soil Nutrients, Climatic Factors, Yield Optimization.

AI DRIVEN EARLY DISEASE DETECTION USING BLOCKCHAIN

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ABSTRACT

Modern healthcare should include artificial intelli- gence (AI) technologies for disease identification and monitoring, particularly for chronic conditions, including heart, diabetes, kidney, liver, and thyroid. According to the World Health Organization (WHO), heart, diabetes, and liver diseases (hepatitis B and C and liver cirrhosis) are leading causes of mortality. The prevalence of thyroid and chronic kidney diseases is also increasing. We conducted a comprehensive review of the available literature to assess the current state of AI advancement in disease diagnosis and identify areas needing further attention. Machine learning (ML), deep learning (DL), and ensemble learning (EL) approaches have gained popularity in recent years due to their excellent results across various medical domains. This study focuses on their application in disease diagnosis and monitoring. We present a framework designed to provide aspir-ing researchers with a foundational understanding of popular algorithms and their significance in disease identification. Addi-tionally, we highlight the importance of blockchain technology in the healthcare industry for safeguarding patient data confiden- tiality and privacy. The decentralized and immutable nature of blockchain can enhance data security, promote interoperability, and empower patients to control their medical information. By demonstrating the potential of advanced ML methods and blockchain technology to transform healthcare systems and improve patient outcomes, our research contributes to the field of disease diagnostics.

Keywords: Blockchain technology, deep learning (DL), disease detection, ensemble learning (EL), machine learn-ing (ML).

SAFETRAX: SMART COLLISION PREDICTION AND ALERT SYSTEM USING IOT FOR SUSTAINABLE TRAFFIC SAFETY

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ABSTRACT

With the rise in traffic accidents worldwide, it has become very important to have a more effective way to ensure road safety. To address this issue, we have made a system called SafeTrax. SafeTrax uses deep learning to predict traffic accidents and car crashes. Additionally, it has been implemented with the Internet of Things (IoT) to gather real-time data from sensors, and AWS Greengrass to process that data quickly and give drivers timely warnings. Unlike old safety systems, SafeTrax can predict if an accident might happen. It warns drivers beforehand to make roads safer for cars, people, and other animals. SafeTrax uses video frames from camera sensors in cars to look for dangers. It then uses a special deep-learning program to figure out if a crash might happen. One important part of SafeTrax is the integration of AWS IoT Greengrass. It helps the system work faster by using cloud services on devices like the Raspberry Pi. This means the system can quickly check the data and send warnings in time. SafeTrax can ensure safer roads, and it can help save lives.

Keywords: Traffic, collision, SafeTrax, AWS IoT Greengrass, deep learning, IoT, pedestrian.

DIGITAL STEGANOGRAPHY

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ABSTRACT

This project, Digital Steganography Using Java, presents an implementation of steganographic techniques for hiding and retrieving secret information inside digital images. The system makes use of Java-based algorithms to manipulate pixel values at the byte level, ensuring that hidden data remains imperceptible to the human eye while preserving the quality of the cover image. The approach focuses on ease of use, security, and reliability, enabling users to embed confidential messages or files into image formats with minimal distortion.

Key features of the system include:

- A straightforward user interface for embedding and extracting hidden information.
- Robust algorithms that maintain the integrity of both cover and secret data.
- Implementation in pure Java, making it platform-independent and easily extendable.

This project demonstrates how digital steganography can serve as a lightweight and effective method for secure information hiding and covert communication, providing an additional layer of protection in data security applications.

MACHINE LEARNING BASED PREDICTION OF UBER RIDE DEMAND AND FARE PRICING

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ABSTRACT

Accurately predicting ride demand is critical to improving Uber performance and increasing customer satisfaction. This paper investigates machine learning methods to predict Uber ride requests by analyzing historical data including time, location, and other factors such as weather. After preprocessing and feature engineering, various models (linear regression, decision trees, random forests, and GBR) are evaluated for their prediction performance. GBR emerged as the best model, achieving over 99% accuracy due to its ability to handle complex data and capture nonlinear relationships. This study highlights the importance of physical and environmental features in improving prediction accuracy, allowing Uber to allocate drivers more efficiently and reduce passenger waiting times. These findings provide insight into demand forecasting, improved management, and service quality of ride- hailing platforms.

Keywords— Uber, ride demand forecasting, machine learning, forecasting, GBR, time series, previous data, infrastructure, distribution, impact of weather forecasting

IOT BASED AUTOMATIC VEHICLE ACCIDENT DETECTION & RESCUE SYSTEM

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ABSTRACT

Road accidents continue to be one of the leading causes of untimely deaths worldwide, with thousands of lives lost each year due to delayed medical assistance and ineffective emergency response systems. In many instances, victims succumb not to the injuries themselves but to the lack of immediate aid and the inability of responders to locate the accident in time. This reality underscores the urgent need for intelligent, automated systems that can bridge the gap between accident occurrence and rescue operation.

The IoT-Based Automatic Vehicle Accident Detection and Rescue System present an innovative solution aimed at minimizing this critical response time by leveraging embedded systems and Internet of Things (IoT) technologies. The system integrates key hardware components such as an accelerometer sensor, GSM module, and GPS module, all orchestrated by the at mega 328 microcontroller. The accelerometer continuously monitors the vehicle's motion and detects abrupt deviations or shocks that typically result from a collision. Once an accident is detected based on a pre-defined threshold, the microcontroller is triggered to initiate an emergency response sequence.

The first action involves retrieving the real-time geographic coordinates from the GPS module, which are then transmitted via the GSM module as an SMS alert to a predefined list of emergency contacts, including guardians and local rescue services. Alongside this, an onboard buzzer is activated to alert bystanders and nearby traffic. This dual-notification mechanism ensures that both remote responders and nearby individuals are made aware of the incident almost instantlyWhat distinguishes this system is its autonomous operation and real-time responsiveness, eliminating any dependence on the driver or passengers—who may be incapacitated—to seek help. It is especially effective in high-density urban environments or remote areas where reporting accidents manually may be delayed or infeasible.

Keywords - IoT (Internet of Things), Vehicle Accident Detection, Automatic Rescue System, Embedded Systems, Accelerometer Sensor, GPS Module, GSM Module Emergency Response, Real-Time Monitoring, Intelligent Automation, Smart Transportation, Public Safety, Accident Alert System, Vehicle Safety System

INTELLIGENT AND SMART AUTOMATED DATA ANALYSER USING THE GENERATIVE ARTIFICIAL INTELLIGENCE MODEL

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ABSTRACT

The increasing reliance on data-centric decision making across domains demands intelligent systems that can simplify analytical workflows while improving interpretability. Conventional automated analysis tools efficiently process large datasets but often fail to convey analytical outcomes in an understandable manner. This work presents an Intelligent Automated Data Analyzer developed using the Django framework and enhanced by a large language model accessed through the Gemini API. The system enables automated preprocessing, exploratory analysis, visualization, and insight generation from structured datasets in formats such as CSV, TSV, and Excel. Analytical results are translated into contextual explanations using both textual and voice-based interfaces. By integrating automated analytics with generative intelligence, the proposed solution enhances accessibility, usability, and comprehension for users with varying levels of technical expertise.

Keywords— Intelligent Data Analysis, Generative AI, Automated Analytics, Gemini API, Explainable Insights, Voice-Enabled Systems

A SCALABLE MUSIC RECOMMENDATION SYSTEM USING HETEROGENEOUS NEURAL NETWORKS

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ABSTRACT

With the rapid growth of online music streaming platforms, users are exposed to millions of songs, making music discovery increasingly challenging. Traditional music recommendation systems primarily rely on user listening history and collaborative filtering techniques, which fail to capture complex relationships such as user–artist, song– genre, and artist–genre interactions. To address these limitations, this paper proposes a Smart Music Recommendation System using Heterogeneous Neural Networks (HNNs). The system models users, songs, artists, and genres as nodes in a heterogeneous graph and learns rich representations through Graph Neural Networks (GNNs). The heterogeneous graph is decomposed into multiple relation-specific subgraphs, and an attention mechanism is employed to aggregate information from different relationships. This enables accurate learning of user preferences and song characteristics. The proposed system generates Top-K personalized music recommendations, improving recommendation accuracy, personalization, and user satisfaction. Experimental analysis demonstrates that the system effectively captures complex relationships and outperforms traditional recommendation approaches.

Keywords: Music Recommendation System, Heterogeneous Neural Network, Graph Neural Network, Attention Mechanism, Top-K Recommendation, Personalization, Deep Learning

AN ADAPTIVE PREDICTIVE MAINTENANCE IN SEMICONDUCTOR MANUFACTURING

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ABSTRACT

Industrial organizations enhance the reliability of their equipment through the intelligent capabilities of this AI-Driven Predictive Maintenance System, which continuously analyzes machine sensor data and operational conditions. The system provides accurate predictions of failure and adaptive maintenance plans by leveraging machine learning, deep learning, and reinforcement learning algorithms. The system analyzes vibration, acoustic, temperature, and electrical current data, as well as maintenance history data, to evaluate machine health and Remaining Useful Life (RUL). By applying supervised learning algorithms such as Random Forest and deep learning algorithms such as Convolutional Neural Networks, the system provides accurate fault identification and degradation trend analysis. Deep Reinforcement Learning algorithms, specifically Deep Q-Networks, are applied to optimize maintenance plans by reducing costs and downtime. To handle imbalanced datasets and rare failure events, GAN- augmented datasets are applied to improve model generalizability and robustness. The system continuously learns from new operational data to improve the accuracy of predictions over time. Industrial maintenance decision- making is improved by this intelligent framework, which reduces unexpected machine failures and improves the efficiency of maintenance activities. System performance is measured using standard metrics such as accuracy, precision, recall, and F1-score to validate the reliability of the system for real-world applications.

Keywords— Predictive Maintenance, Machine Learning, Deep Learning, Reinforcement Learning, CNN, DQN, GAN, Remaining Useful Life, Industrial Analytics, Decision Support System.

DEEP LEARNING BASED RETINAL IMAGE ENHANCEMENT FOR IMPROVED NEURODEGENERATIVE DISEASE ANALYSIS

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ABSTRACT

Retinal image analysis plays a vital role in the early detection of Neurodegenerative diseases, which involve progressive neuronal loss and pose significant public health challenges. The retina, as an extension of the central nervous system, provides a non-invasive window into disease processes, with retinal lesions often reflecting underlying neurodegenerative changes and causing vision impairment. Traditional Convolutional Neural Networks (CNNs) like VGG16 and ResNet50 extract local features effectively but struggle to capture global context and are sensitive to variations in image quality and patient data. Vision Transformers (ViTs) address these limitations by using self-attention mechanisms to model long-range dependencies across the entire retinal field, enabling precise detection of subtle pathological markers. This transition from CNNs to ViTs enhances predictive accuracy, robustness, and interpretability. By providing reliable retinal biomarkers, ViTs support early diagnosis and informed clinical decision-making. Ultimately, this approach contributes to personalized healthcare and improved patient outcomes, advancing the management of neurodegenerative diseases.

Keywords— Rentinal Image Analysis,Neurodegenerative Disease ,Vision Transformer,Deep Learning,Self AttentionMechanism,Convolutional Neural Network

AN EFFICIENT ENSEMBLE LEARNING FRAMEWORK FOR ACCURATE HOUSE RENT PREDICTION

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ABSTRACT

Predicting the exact prices of house rent is not an easy task due to variability and the involvement of many factors. Generally, the prediction is done based on guessing and comparing the prices with other houses around that location or neighborhood. Recently, with the help of various machine learning algorithms, house rent prediction is achieved more efficiently by considering the previously calculated rent and key factors such as location, area, bedroom, etc. To complete the purpose of this project, various machine learning algorithms are implemented and their performance is compared and analyzed based on error, mean squared error, root mean squared error, mean absolute error, and R^2 values. Among various algorithms, Linear Regression had lower performance with an R^2 value of 0.5423, whereas the performance of other algorithms such as Random Forest, XGBoost, and CatBoost is high with R^2 values 0.9782, 0.9658, and 0.9739, respectively. Although all algorithms have shown excellent performance for this problem, relying on any single algorithm alone may not yield the most optimized prediction outcome in terms of balance. Thus, an efficient ensemble learning algorithm has been developed that helps combine the respective strengths of these algorithms. The ensemble algorithm enabled the development of an ensemble model with an R^2 value of 0.9778 with lower error rates, thereby showing its effectiveness as a more reliable solution for precise house rent prediction than any other algorithm considered for this problem.

Keywords: House Rent Prediction, Rental Price Estimation, Ensemble Learning, Random Forest, XGBoost, CatBoost, Data Preprocessing, Feature Selection, Regression Analysis, Real Estate Analytics.

OPTIMIZING DEEP LEARNING MODELS FOR DIABETIC RETINOPATHY WITH NATURE-INSPIRED HYPER PARAMETER TUNING ALGORITHMS

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ABSTRACT

Diabetic Retinopathy (DR) is a major microvascular complication of diabetes and a leading cause of preventable vision loss. Manual screening is time- consuming and highly dependent on expert ophthalmologists, making large-scale deployment challenging. To overcome these limitations, this paper proposes an Enhanced Diabetic Retinopathy Detection and Classification Model based on a Hybrid Whale Optimization Algorithm (EDRDCM-HWO). The framework integrates effective preprocessing techniques, including Gabor filtering, CLAHE, noise reduction, and retinal segmentation, to enhance fundus image quality. A lightweight SqueezeNet-based convolutional neural network is employed for efficient feature extraction and classification. To handle class imbalance, focal loss and weighted sampling are incorporated during training. Additionally, a hybrid Whale Optimization strategy is used to automatically tune key hyperparameters, improving model performance and generalization. The proposed model is evaluated using standard performance metrics and deployed through a web-based Django application for real- time DR severity prediction. Experimental results on benchmark datasets demonstrate that EDRDCM-HWO outperforms existing optimization-based deep learning models, highlighting its suitability for automated DR screening and clinical decision support.

KEYWORDS: Diabetic Retinopathy Detection, Hybrid Whale Optimization Algorithm, Deep Learning, Gabor Filtering, SqueezeNet, Focal Loss, Model Evaluation, Django Application.

LEVERAGING DEEP LEARNING TO TRANSFORM RAW HEALTH DATA INTO OBESITY

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ABSTRACT

Obesity has become a major global health concern due to rapid lifestyle changes, unhealthy dietary habits, and reduced physical activity. The increasing prevalence of obesity significantly raises the risk of chronic diseases such as diabetes, cardiovascular disorders, and metabolic syndromes. Early and accurate prediction of obesity is essential for effective prevention and healthcare planning Existing obesity prediction systems primarily employ traditional machine learning algorithms such as Logistic Regression, Decision Trees, Support Vector Machines, k-Nearest Neighbors, and Multi-Layer Perceptron (MLP) networks. While these approaches deliver acceptable predictive performance, they often struggle to effectively model high-dimensional data and capture complex, non-linear relationships among health- related attributes. To address these limitations, this work proposes an advanced deep learning–based obesity prediction framework that integrates supervised autoencoders with an MLP classifier. The supervised autoencoder enhances feature representation by learning discriminative and compact latent features, while the MLP leverages these features for accurate classification. Experimental results demonstrate that the proposed hybrid model outperforms existing machine learning and standalone MLP approaches in terms of prediction accuracy, robustness, and generalization capability, making it a reliable solution for obesity risk assessment.

Keywords: Obesity Prediction, Supervised Autoencoders, Deep Learning, Multi-Layer Perceptron, Feature Representation

RESILIENT TRAFFIC SIGNAL TIME CONTROLLER FOR TRAFFIC MANAGEMENT USING ARTIFICIAL INTELLIGENCE

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ABSTRACT

Traffic congestion has become a major issue in modern cities because of rapid urban growth and the rising number of vehicles. This results in longer travel times, higher fuel use, and more environmental pollution. Traditional traffic signal control systems work on fixed schedules and don't respond well to real-time traffic conditions, leading to poor traffic flow. This paper introduces a strong and adaptable traffic signal control system using artificial intelligence and computer vision techniques. The proposed system analyzes video streams from CCTV cameras at traffic intersections to detect vehicles, measure traffic density, and adjust signal timings dynamically for better traffic flow. It also features emergency vehicle detection and prioritization, ensuring that vehicles like ambulances and fire trucks get immediate right-of-way by changing signal phases automatically. Additionally, the system includes a human- machine interaction feature that allows authorized personnel to take control of traffic signals using hand gestures during emergencies, unusual traffic situations, or system failures. By combining smart vehicle detection, flexible signal control, emergency prioritization, and manual management, this system improves flexibility, reliability, and responsiveness. The goal is to cut down on vehicle waiting times, fuel use, and emissions while offering a scalable and affordable solution for smart urban traffic management systems.

Keywords—Adaptive Traffic Control, Vehicle Detection, Emergency Vehicle Prioritization, Artificial Intelligence, Computer Vision, Hand Gesture Recognition, Intelligent Transportation Systems.

AN ENHANCED AND INTELLIGENT FRAMEWORK FOR FAKE JOB POST DETECTION USING MACHINE LEARNING

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ABSTRACT

With the rapid expansion of online job portals, fake job advertisements have become a major threat to job seekers and recruitment platforms. Fraudulent postings are often designed to appear genuine, making manual detection difficult and unreliable. This project proposes an automated system for detecting fake job advertisements using Machine Learning and Deep Learning techniques. The system preprocesses job description text using tokenization, lemmatization, stop- word removal, and TF-IDF vectorization. Multiple classification models, including Naïve Bayes, Logistic Regression, Random Forest, AdaBoost, Gradient Boosting, Convolutional Neural Networks (CNN), and Bidirectional Long Short-Term Memory (BiLSTM), are trained and evaluated. Model performance is measured using accuracy, precision, recall, and F1-score. The proposed system reduces human effort, minimizes exposure to fraudulent job listings, and enhances trust and security in online recruitment platforms.

Keywords: Fake Job Post Detection, Naïve Bayes, Logistic Regression, Random Forest, TF-IDF, Gradient Boosting, Deep Learning, CNN, BiLSTM, Ensemble Techniques.

ENHANCED PREDICTIVE INTELLIGENCE FOR MULTI- ORGAN TRANSPLANTATION IN ORGAN PROCUREMENT SYSTEM BY MACHINE LEARNING MODELS

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ABSTRACT

Organ Procurement Organizations (OPOs) have a vital function within Organ Transplants, but a lack of transparency between organ allocations does pose operational and ethical concerns. This research utilizes Organ Referral Data, i.e., 133,101 organ donor referrals, through a novel application of Organ and Donor Selection along with Multi Organ Transplants using Machine Learning (ML). ML classification technique like Logistic Regression, ANN, Navie Bayes, and others were used to create models for Donor Selection and Multi Organ Transplants based on Organ and Donor Selection using Organ Referral Data. The models built were able to achieve Donor Selection Recalls up to 0.80, while a high performance of the model has also been achieved, as AUC Values have been observed to be higher than 0.95. For Multi Organ Transplants, Recalls have been achieved between0.88 and 0.98, while AUC values have been observed to be greater than 0.97. Administrative milestones and organ- specific transplants have been recognized as operational factors which have impacted organ allocation.

Keywords: Organ Procurement Organizations,OrganTransplantation,MachineLearning,Donor Selection

A MACHINE LEARNING-BASED REAL-TIME REMAINING USEFUL LIFE ESTIMATION AND FAIR PRICING STRATEGY FOR ELECTRIC VEHICLE BATTERY SWAPPING STATIONS

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ABSTRACT

The increasing adoption of electric vehicles (EVs) has led to the widespread implementation of battery swapping stations. However, ensuring fairness in battery pricing remains a significant challenge since variations in battery health and performance among swapped batteries can result in user dissatisfaction and operational inefficiencies. This paper introduces a novel approach to enhance fairness in battery swapping by integrating a machine learning-based real-time prediction model with a pricing strategy based on remaining useful life (RUL) estimation to address this issue. The proposed solution comprises a real-time RUL estimation system and a dynamic pricing mechanism that ensures fair pricing based on battery health and performance. This integrated approach aims to improve user satisfaction and the operational efficiency of swapping stations. The paper evaluates various machine learning algorithms for real-time RUL estimation regarding accuracy, computation time, and memory usage. The results suggest that XGBoost provides the most suitable balance between accuracy and efficiency, making it an effective solution for real-world applications. Comparative analysis shows that the XGBoost model outperforms the second-best method (Random Forest) with a lower error (3.50 vs 3.79) while maintaining competitive computational efficiency (9.75 vs 8.52 seconds) and memory usage (2.12 vs 2.32 MB) when solving a typical numerical case study problem. The proposed approach has the potential to accelerate the adoption of electric vehicles and contribute to sustainability goals by promoting efficient battery utilization and fair pricing mechanisms.

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GENERATIVE AI–DRIVEN HYBRID GAN–VAE FRAMEWORK FOR REAL- TIME FRAUD DETECTION IN IMBALANCED E-COMMERCE TRANSACTIONS

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ABSTRACT

The rapid advancement of digital technologies has significantly transformed the global commerce ecosystem, leading to the widespread adoption of e-commerce platforms. While these platforms provide convenience, scalability, and global accessibility, they also face a growing threat from fraudulent activities. Online fraud has become increasingly sophisticated, resulting in severe financial losses, reduced customer confidence, and operational inefficiencies for businesses. Traditional fraud detection systems largely depend on rule-based mechanisms and classical machine learning models, which struggle to adapt to dynamic fraud patterns and real-time transaction environments. This paper proposes a Generative AI based approach for real-time fraud detection in e- commerce systems. The proposed system analyses transactional data using machine learning models combined with Generative AI-based anomaly detection techniques to identify suspicious activities in real time. Key transactional attributes such as transaction amount, payment method, geographical location, IP address, and historical user behaviour are considered for fraud analysis. The system is implemented as a web-based application using the Django framework, enabling real- time monitoring, prediction, and visualization of fraud detection results. Experimental evaluation demonstrates that the proposed approach improves fraud detection accuracy, reduces false positives, and enhances adaptability compared to traditional systems. The results confirm the suitability of the proposed system for deployment in real-world e-commerce environments.

Keywords: Generative AI, E-Commerce Fraud Detection, GAN (Generative Adversarial Networks), VAE (Variational Autoencoders), Hybrid GAN-VAE, Real-Time Systems, Machine Learning.

ENHANCING MOBILE APP RECOMMENDATIONS WITH CROWDSOURCED EDUCATIONAL DATA USING MACHINE LEARNING AND DEEP LEARNING

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ABSTRACT

In the rapidly evolving digital landscape, personalized recommendations have become essential for enhancing user experience. Machine learning models analyze user behavior patterns to suggest relevant entertainment, education, or e-commerce content. Mobile devices make it easier to gather educational data through crowdsourcing, which opens new possibilities for improving app recommendation algorithms. This paper provides valuable methodologies for scalable student recommendation and educational systems, highlighting DL's advantages over CF in handling sparse, time-sensitive datasets. The objective of this study is to recommend apps to university students by category based on app usage patterns. Data was used to evaluate these 806 university students to train the Collaborative Filtering (CF) and Contemporary Deep Learning (DL) models. The results demonstrate that Gated Recurrent Units (GRU) are the best option forreal-time, customized suggestions because of their capacity to simulate successive interactions and adjust to changing user behavior. The GRU yields the lowest mean errors MAE of 0.2246, RMSE=0.2516, and superior short-term predictions k=4 MAE of 0.1319 and RMSE of 0.1319. Other techniques, i.e., Stacked Auto-Encoder, exhibit the sign of overfitting with an MAE of 0.0001, whereas the LSTM and Graph
Auto-Encoder perform below GRU with an MAE of 0.3453 and 0.8992. Although the CF techniques suffer from temporal dynamics and data sparsity, even the KNNBasic stands out among all CF algorithms with the lowest MAE of 0.548 and RMSE of 0.754, demonstrating the highest predictive accuracy.

Keywords: Machine learning, deep learning, recommender system.

Proceedings of National Conference on “Emerging Trends in Engineering and Management ETEM-2K26"

This book presents the proceedings of National conference on Emerging Trends in Engineering and Management ETEM-2026. The conference provides a forum to all engineers and scientists to deliberate on the innovative tools and techniques that are needed to face the challenges in four aspects, namely, Quality, Productivity, Safety and Economy (QPSE). This book discusses the emerging research areas, providing a valuable resource for researchers and engineers.

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