3rd International Conference on Modern Optimization and Technological Advancement for Resilient Smart Systems

06th & 07th March, 2026 | Ahmedabad, India

Organized by:

LJ Institute of Computer Applications, LJK University
In Association with IFERP Academy

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3rd International Conference on Modern Optimization and Technological Advancement
for Resilient Smart Systems (ICMOTARSS-2026), Ahmedabad, India

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Modern Optimization and Technological Advancement for Resilient Smart Systems

PREFACE

We are delighted to extend a warm welcome to all participants attending 3rd International Conference on Modern Optimization and Technological Advancement for Resilient Smart Systems (ICMOTARSS-2026), taking place in Ahmedabad, India on 06th & 07th March, 2026. This conference provides a vital platform for researchers, students, academicians, and industry professionals from all over the world to share their latest research results and development activities in the field of Sustainable Agriculture and Climate Resilience. It offers delegates an opportunity to exchange new ideas and experiences, establish business or research relationships, and explore global collaborations.

The proceedings for ICMOTARSS-2026 contain the most up-to-date, comprehensive, and globally relevant knowledge in the field of Engineering, Technology and Management. All submitted papers were subject to rigorous peer-reviewing by 2–4 expert referees, and the papers included in these proceedings have been selected for their quality and relevance to the conference. We are confident that these proceedings will not only provide readers with a broad overview of the latest research results in Modern Optimization and Technological Advancement for Resilient Smart Systems but also serve as a valuable sussssmmary and reference for further research in this field.

We are grateful for the support of many universities and research institutes, whose contributions were vital to the success of this conference. We extend our sincerest gratitude and highest respect to the many professors who played an important role in the review process, providing valuable feedback and suggestions to authors to improve their work. We also extend our appreciation to the external reviewers for providing additional support in the review process and to the authors for contributing their research results to the ICMOTARSS-2026.

Since January 2026, the Organizing Committees have received more than 160+ manuscript papers, covering all aspects of ICMOTARSS-2026. After review, approximately 150 papers were selected for inclusion in the proceedings of ICMOTARSS-2026. We would like to thank all participants at the conference for their significant contribution to its success. We express our gratitude to the keynote and individual speakers and all participating authors for their dedication and hard work. We also sincerely appreciate the efforts of the technical program committee and all reviewers, whose contributions made this conference possible. Finally, we extend our thanks to all the referees for their constructive comments on all papers, and we express our deepest gratitude to the organizing committee for their tireless work in making this conference a reality.

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ABOUT
3rd ICMOTARSS-2026

LJ Institute of Computer Application and IFERP Academy will host the 3rd International Conference on Modern Optimization and Technological Advancement for Resilient Smart Systems (ICMOTARSS-2026). This global event aims to bring together leading researchers, academicians, industry experts, innovators, and students to exchange breakthrough ideas, cutting-edge research, and practical insights. With multidisciplinary tracks spanning Artificial Intelligence, Optimization Techniques, Data Science, Internet of Things (IoT), Cybersecurity, Smart Engineering Solutions, Cognitive Computing, and emerging areas in resilient and intelligent systems, the conference seeks to foster knowledge-sharing and inspire advancements in future-ready technologies. ICMOTARSS-2026 will feature keynote addresses, invited expert lectures, panel discussions, and peer-reviewed paper presentations delivered by esteemed global professionals.

Aligned with LJK University's vision of fostering high-quality, inclusive, and industry-aligned education, ICMOTARSS-2026 serves as a platform to promote interdisciplinary collaboration, innovation, and impactful research. Leveraging the university's strong academic ecosystem—supported by modern infrastructure, research-driven pedagogy, incubation centers, and established industry partnerships—the conference aims to accelerate transformative research and contribute to the development of secure, resilient, and intelligent technological ecosystems.

Through meaningful discussions, research engagement, and collaborative opportunities, this event aspires to empower participants to address contemporary technological challenges and shape the future of smart, sustainable, and resilient systems.

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ABOUT COLLEGE

LJ Group of Institutes is managed by Lok Jagruti Kendra (LJK), a Charitable Trust and a Registered Society established in1980 by eminent academicians and visionaries like Prof. B.M. Peerzada, former Dean of Commerce Faculty,Gujarat University, Padma Bhushan Lord Meghnad Desai (London School of Economics), Prof. Gautam Appa (LSE), Late Prof. M.S. Trivedi, former Vice Chancellor, South Gujarat University, renowned jurist Late Shri Girishbhai Patel and Shri Subodhbhai Shah. It was envisioned as "a key player in education and social development by promoting and nurturing creativity, scholarship, innovation and excellence through a chain of quality institutes." LJK's mission has been "to establish and manage institutions with an environment in which new ideas, delivery strategies and scholarship flourish and from where leaders and innovators of tomorrow shall emerge.

LJK runs 32 institutions on two well-developed environment-friendly campuses with dedicated buildings and infrastructure facilities, and offering various diploma, undergraduate and postgraduate programmes duly approved by respective apex bodies. LJ Institutes have over 21000 students and 1000+ faculties engaged in teaching-learning, research and extension activities and striving to develop students into complete citizens not only having the necessary subject knowledge and skills, but also the empathy towards various environmental, social, cultural and other issues affecting the society.

Some of the remarkable initiatives/activities/features of the LJ Institutes are:

- The Business Incubator is an initiative to encourage, promote and support entrepreneurship and innovative Start-ups by bringing national angel syndicates and angel investors for funding.
- LJK has set up LJ Knowledge Foundation to promote innovation and start-up interventions in the campus, which has pioneered a series of efforts to harness creative potential of students. It is a nodal agency of Start-up Innovation Scheme of the Government of Gujarat.
- For promotion of innovation and entrepreneurship, an annual LJ Innovation Village is being organised since 2013 displaying the projects of students of LJ Institutes as well those from over 10 other states of India
- A unique program, Project to Product, in which student-projects get converted into productive solutions and then taken to the market
- Collaborating with industry to conduct Corporate & Skill Development Training for their employees. More than 5000 employees of Ford, Toyota, Suzuki and the Pharma Industry have been trained so far.
- Central Placement Cell is associated with more than 200 leading national and multinational companies to facilitate students for the best job.
- LJ School of Law has has taken a pioneering initiative called Law on Wheels designed to serve twin purposes: social as well as academic. Under this the students go to interior villages to study the social reality, legal problems of different classes of people and to spread legal awareness by rendering legal advice and assistance to the socio-economically backward classes.
- Through LJ Sahyog more than 2000 engineering students visited 250 villages and successfully developed websites and Facebook pages for them, contributing thereby towards Digital India initiative.

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- LJ also runs several Centres of Excellence focused on communication/ presentation skills, personality development, etc. to empower the students with sharp minds and exceptional talent.
- LJ Software Factory prepares customized application softwares for business houses and industries.
- Regular centre for Conduct of Online Examinations such as CAT, MAT, GATE, AIEE, BITS Pilani, GCET, etc.
- Congenial learning environment with state-of-the-art infrastructure facilities with Technologically Well-Equipped classrooms, laboratories, faculty rooms, rich libraries, seminar halls and auditoria
- Learner-centred academic culture without compromise on teaching standards and the knowledge distribution system leading to overall development of students with balanced emphasis on sports, cultural and other extra-curricular activities.
- Curriculum enrichment with skill-oriented add-on courses and innovative co-curricular activities followed by varied delivery strategies.
- Over 2000 computers linked with optic fiber network.
- International Collaborations with faculty exchange, student exchange, joint research projects and research publications as thrust areas.
- Strong Alumni Base spread across the country and abroad and occupying key positions in various organizations.
- LJK, where education is a passion, the passion which leads to incessant pursuit of knowledge and acquisition of skills, has become the ultimate destination for complete education.

Major Achievements of College

Lok Jagruti Kendra Trust has

- Total 3 Campuses (Vastrapur, Sarkhej, Sindhu bhavan Road)
- 20,000 plus students at present
- 1000 plus faculty members
- 32 courses
- 16 Schools of varied disciplines
- 100 % placement in the majority of courses
- 500 plus companies associated including IBM, Reliance, Infosys, Tata Group, Intas Pharma, etc
- Medical services at 2 places - Vejalpur and Vadaj
- Law on Wheels for awareness in rural areas
- Langar feeding 300 plus needy people daily
- Coming up with a huge charitable hospital with a 200-bed capacity by 2024.
- 60,000 plus alumni across the globe
- Incubation center which nurtures startups with Funds, Mentors, Infra, etc - 200 plus supported, 12 incubated at present, 38 graduated with total 600 plus employment generated and combined revenue of around ₹ 30 Cr
- Corporate training is given to 6,000 plus Employees of Ford, Tata Motors, Toyota, and Ashok Leyland.
- Largest center to conduct entrance exams of many authorized certification bodies (CAT, CLAT, GPSC, UPSC, etc)
- WE ARE THE LARGEST IN STUDENT VOLUME IN AHMEDABAD WHEN IT COMES TO HIGHER EDUCATION. *

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ABOUT
IFERP

The IFERP Academy is a committed professional organization that advances engineering, science, and technology. IFERP anticipates a global scientific community brought together by digital innovation. This organization puts a great emphasis on promoting research activities, communicating the newest insights, and driving industrial trends.

IFERP has built strong networks throughout Asia, the Middle East, Europe, and countries such as Iraq, Malaysia, Australia, and more. They have incorporated networking, research support, publications, and worked in other scientific areas.

IFERP excels in organizing International Conferences that connect researchers worldwide. It holds important international webinars, publishes journals and publications that are indexed by Web of Science and SCOPUS, and provides thorough research assistance and guidance. Engaging in Youth Empowerment projects and encouraging Industry-Institute Interaction are key components of IFERP's goal. The organization is committed to enabling professionals through faculty advancement, skill development, and persistent research and publication initiatives.

Mission

Upskilling the knowledge hub through technological innovation and excellence for the benefit of humanity.

Vision

A Digitally equipped robust, dynamic & swift professional community integrating academics & industry for upgraded technical knowledge implementation.

Value

IFERP values the restoration of high-level technological research, learning, collaboration, resource sharing & community-building traditions.

Goal

To serve as the foundation for all technological progress and advancement activities around the world.

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FROM
COLLEGE DIGNITARIES

Mr. Alok Manke
Director, LJ University, Ahmedabad, India

It is with great pleasure that we present the proceedings of the 3rd International Conference on International conference on Modern Optimization and technological advancement for Resilient Smart System (ICMOTARSS-2026), held in Ahmedabad, Gujarat, India from 6th-March-2026 to 7th-March-2026. This collection of papers represents the culmination of rigorous research and dynamic discussions from leading academics, industry professionals, and emerging scholars across the globe. The contributions within this volume reflect the conference's core mission to foster interdisciplinary dialogue and address the pressing challenges facing our world today. We extend our deepest gratitude to the esteemed keynote speakers, the diligent organizing and program committees, and all the authors whose valuable work has made this publication possible. It is our hope that these proceedings will serve as a significant resource for the community and inspire further innovation and collaboration.

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FROM
COLLEGE DIGNITARIES

Dr. Dinesh Awasthi Ph.D. (Econ.)
Professor, Vice-chancellor

It is a profound privilege to extend a warm and cordial welcome to all delegates, researchers, academicians, industry professionals, and students attending the 3rd International Conference on "*Modern Optimization and Technological Advancement for Resilient Smart Systems*." We gather today at a pivotal moment in history, as the world navigates an unprecedented technological evolution alongside complex societal and environmental challenges.

Today, we are not merely inaugurating an academic gathering; we are opening a critical dialogue about the future we are collectively building. We live in an era defined by complexity, where recent global events have reminded us of one undeniable truth: resilience is no longer optional—it is essential. While optimization serves as the science of making the best possible decisions within constraints—maximizing efficiency and minimizing waste—optimization alone does not guarantee stability. A system optimized for efficiency but lacking adaptability may collapse under stress. Therefore, the challenge before us is to move beyond mere performance and ask: how do we optimize for durability, flexibility, and sustainability?

As we embed intelligence into our infrastructure, we must remember that technology is not just about innovation; it is about responsibility. A truly resilient smart system must be technologically advanced, yet socially inclusive and environmentally conscious, prioritizing ethical AI practices and equitable access. Universities and research institutions carry a special responsibility as the birthplaces of these transformative ideas. Whether through ground-breaking algorithms or advanced simulation models, this conference is a mission to build systems that are intelligent yet stable, and optimized yet humane.

In this context, I must express my sincere appreciation to the L.J. School of Computer Applications (LJSCA) for their meticulous planning and academic vision. Their dedication has been instrumental in bringing together such a distinguished global forum of eminent scholars. My heartiest congratulations and compliments to the organisers, specially Prof. Alok Manke, Convenor and Pooja, coordinator of the Conference.

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This event is not only about presenting papers; it is about questioning assumptions, identifying research gaps, and exploring future directions. I encourage all participants to actively engage in these insightful discussions and explore collaborative opportunities that transcend institutional and national boundaries. My sincere gratitude goes to the keynote speakers, session chairs, reviewers, and sponsors who have made this intellectual gathering possible. The future will belong to those who can design systems that do not just function, but endure. I wish the conference a resounding success.

Dinesh Awasthi

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FROM
MANAGING DIRECTOR, IFERP

Mr. A. Siddth Kumar Chhajer
MD & Founder,
IFERP, Technoarete Groups

On behalf of Institute For Educational Research and Publications (IFERP) & the organizing Committee, I express my hearty gratitude to the Participants, Keynote Speakers, Delegates, Reviewers and Researchers.

The goal of the 3rd International Conference on Modern Optimization and Technological Advancement for Resilient Smart Systems (ICMOTARSS-2026) is to provide knowledge enrichment and innovative technical exchange between international researchers or scholars and practitioners from the academia and industries in the field of Modern Optimization and Technological Advancement for Resilient Smart Systems.

This conference creates solutions in different ways and to share innovative ideas in the field of Modern Optimization and Technological Advancement for Resilient Smart Systems. ICMOTARSS-2026 provides a world class stage to the Researchers, Professionals, Scientists, Academicians and Students to engage in very challenging conversations, assess the current body of research and determine knowledge and capability gaps.

3rd International Conference on Modern Optimization and Technological Advancement for Resilient Smart Systems (ICMOTARSS-2026) will explore the new horizons of innovations from distinguished Researchers, Scientists and Eminent Authors in academia and industry working for the advancements in Science and Engineering from all over the world. ICMOTARSS-2026 hopes to set the perfect platform for participants to establish careers as successful and globally renowned specialists in the field of Modern Optimization and Technological Advancement for Resilient Smart Systems.

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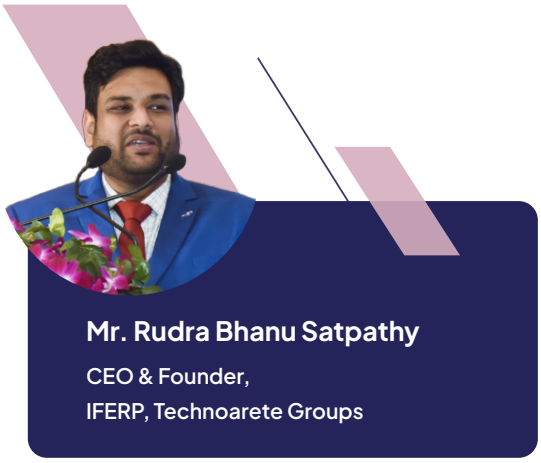
FROM
CHIEF EXECUTIVE, IFERP



Mr. Rudra Bhanu Satpathy
CEO & Founder,
IFERP, Technoarete Groups

IFERP is hosting the 3rd International Conference on Modern Optimization and Technological Advancement for Resilient Smart Systems (ICMOTARSS-2026) this year in month of 6th & 7th March, 2026, Ahmedabad, India . The main objective of ICRILSH-2026 is to grant the amazing opportunity to learn about groundbreaking developments in modern industry, talk through difficult workplace scenarios with peers who experience the same pain points and experience enormous growth and development as a professional. There will be no shortage of continuous networking opportunities and informational sessions. The sessions serve as an excellent opportunity to soak up information from widely respected experts.

Connecting with fellow professionals and sharing the success stories of your firm is an excellent way to build relations and become known as a thought leader. I express my hearty gratitude to all my Colleagues, Staffs, Professors, Reviewers and Members of Organizing Committee for their hearty and dedicated support to make this conference successful. I am also thankful to all our delegates for their pain staking effort to make this conference successful.

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ABOUT
KEYNOTE SPEAKER

Dr. Dipankar Deb

Professor, Centre for AI and Robotics, IIT Mandi, Faculty incharge & Director incubation, IIT Mandi Catalyst

Dipankar Deb is a Professor in the Center for AI and Robotics at IITMandi. He has been a Professor in Electrical Engineering at Institute of Infrastructure Technology Research and Management (IITRAM) Ahmedabad since January 2019. He is a Senior Member of IEEE and has served a couple of years at IIT Guwahati as an Assistant Professor (AGP 8000) during 2010–2012. He has over 6 years of Industrial experience both in New York (USA) and GE Global Research (Bengaluru) India. From July 2015 to Jan 2019, he has served as an Associate professor, and from Jan 24, 2019, onward he is a Professor of Electrical Engineering. He holds 6 US patents, and 11 Indian Patents, and has published 59 SCI indexed Journal articles and 40+ International conference papers. He has also authored 12 books with reputed publishers like Springer and Elsevier. He is a Book Series editor with Springer for the series: "Studies in Infrastructure and Control". He is also a Book Series Editor with CRC Press on Control Theory and Applications, and an Associate Editor for IEEE Access. He has also worked extensively in areas such as Adaptive Control, Active flow control, Renewable Energy, Cognitive Robotics and Machine Learning. He is listed in the top 2% of researchers word-wide in the years 2020, 2021 and 2022

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ABOUT
KEYNOTE SPEAKER

Ts. Dr. Norita Md Norwawi

Professor, Department of Computer Science, Universiti Sains Islam Malaysia, Malaysia

Prof. Ts. Dr. Norita Md Norwawi is currently an Academic Fellow at Universiti Sains Islam Malaysia (USIM), bringing over 30 years of experience in computer science and artificial intelligence. She previously served as Professor at USIM from 2014 to 2024, during which she held several key leadership positions, including Dean, Director, and Head of Research Units. She earned her PhD in Computer Science from Universiti Utara Malaysia and specializes in machine learning, temporal data analytics, and AI ethics.

A certified professional technologist, Prof. Norita is an active member of prominent international organizations such as Association for the Advancement of Artificial Intelligence (AAAI), Institute of Electrical and Electronics Engineers (IEEE), Association for Computing Machinery (ACM), and the Malaysian Academy of Professors. Internationally recognized, she has served as a guest speaker and visiting scholar at global platforms including the United Nations, University of Oxford, and UNESCO-related events. Her research and development activities focus on responsible and ethical AI, smart applications, and sustainable innovation, with extensive publications in indexed journals. She is also a Senior Fellow of the AI for Developing Countries Forum (AIFOD) and a Fellow of the Academy of Sciences Malaysia (FASc).

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ABOUT
KEYNOTE SPEAKER

Dr. Hitesh Shrimali

Professor, School of Computing & Electrical Engineering, IIT Mandi, Member, Board of Governors (BoG), IIT Mandi

Dr Hitesh Shrimali is a full Professor in the School of Computing & Electrical Engineering at IIT Mandi, and serves as a Member of its Board of Governors (BoG). He is also associated with the board of directors, IIT Mandi Catalyst (the institute's technology incubator), reflecting his broader involvement in institutional governance, academic-innovation interfaces, and support for emerging technology ventures linked to IIT Mandi. His academic journey began with a B.E. from Nirma Institute of Technology, Ahmedabad, followed by an M.Tech. from IIT Kharagpur and a PhD from IIT Delhi. Before joining IIT Mandi as a faculty member, he worked as a Senior Design Engineer at STMicroelectronics (Greater Noida) and later undertook postdoctoral research at the University of Milan, in collaboration with INFN Milano. At IIT Mandi, Dr. Shrimali has held numerous administrative and coordination roles over the years: he was Dean (Students), IIT Mandi, served as Nodal Officer for the nationally funded PhD scheme under Ministry of Electronics & IT (MeitY), Discipline Core Committee (DCC) Chair-VLSI, Programme Coordinator for BTech/MTech-VLSI, Coordinator of the Institute's IP & Technology Transfer Cell, and chaired several important committees — including the school publicity committee, BTech (EE) curriculum-review committee, Student Affairs Panel (SAP), and BTech IC-PFG. He has also served as Course Coordinator for the M.Tech (VLSI) program, Head of the Science and Technology Council (SNTC), Faculty Advisor for the BTech and M.Tech VLSI/EE batches, and held roles such as Chief Election Officer for the Student Gymkhana. Additionally, he has been serving as Treasurer for the IEEE Circuits and Systems Society of the Delhi Chapter for the past three years. In research, Dr Shrimali specialises in the design and testing of radiation-hard circuits (such as CMOS silicon detectors), analogue and mixed-signal VLSI design (On-chip analogue-to-digital data Converters), modelling radiation effects on analogue/mixed circuits, and on-chip instrumentation. Under his guidance, his group at IIT Mandi has successfully tape-out several chips, including dosimetry applications, a Thermoelectric cooler (TEC) controller, high-voltage front-end electronics for particle detection, EEG front-end circuits, low-noise instrumentation amplifiers for sensors, hybrid flash-SAR ADCs, frequency synthesisers, etc.

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On the recognition front, Dr Shrimali is a recipient of the Young Faculty Research Fellowship (YFRF) awarded by MeitY, Government of India. He has also received awards from IIT Mandi for teaching and institutional service, including the "Excellent and Consistent Teaching Performance Combined with Contributions Towards Institute Services" (2021) and the "All-Rounder Contribution Award" (2017). He is also a distinguished alumnus awardee from Nirma University, Ahmedabad (2017), and a Young Faculty Fellow of IIT Mandi.

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ABOUT
PANEL DISCUSSION

Mr. Supreet Tare
Founder & CEO, Taritas – Voice AI Solutions Agency, Jabalpur, India

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Co-Founder, Openspectrum AI Pvt. Ltd., India

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ABOUT

ORGANIZING COMMITTEE MEMBERS

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CSSR: Collapsed Structure Search and Rescue Operation Using Radar Sensors

Jeevanneswar N
IT Student, PSNA College of Engineering and Technology Dindigul, Tamil Nadu, India

Abstract:

Traditional human rescue search techniques often prove inefficient in victim regions such as earthquake, landslides and collapsed structures as they require extensive time and may overlook individuals buried deep within debris. The proposed solution introduces an intelligent rescue system leveraging micro-wave radar sensors to enhance human detection capabilities in such critical situations. The system dynamically identifies trapped victims beneath the rubble, with the sensor capable of detecting human presence up to 4 meters underground. The core component, an Arduino Uno microcontroller, processes real-time sensor data, which is then displayed on an LCD screen, providing immediate and clear feedback for rescue teams. This enables first responders to quickly locate survivors and take necessary action without delays. To ensure seamless operation, the system integrates IoT and GPS technologies, allowing real-time monitoring and location tracking. By automating the victim detection process and reducing dependency on manual search methods, the system significantly improves the speed, accuracy, and efficiency of CSSR missions. This approach not only minimizes rescue time but also enhances the chances of survival for trapped individuals. The technology is designed to be portable and integrated easily into rescue teams' existing equipment, ensuring practical deployment in emergency scenarios. Ultimately, this research aims to revolutionize CSSR techniques by offering a smarter, faster, and more reliable solution for life-saving operations in disaster-stricken areas.

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A Comprehensive Survey on Convolutional Neural Network- Based Approaches for Bone Abnormality Detection

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Research Scholar, Department of CSE, Visvesvaraya Technological University, Centre of PG Studies, Kusnoor road, Kalaburagi, India

Dr. Mohammed Abdul Waheed
Associate Professor , Department of CSE, Visvesvaraya Technological University, Centre of PG Studies, Kusnoor road, Kalaburagi, India

Abstract:

Skeletal fracture analysis from X-ray images promoted a lot from deep learning. In simple terms, here's how it's determining up Bony abnormalities like Fractures, metabolic and degenerative diseases, deformities, and tumors are still difficult to diagnose because of complicated imaging and subjectivity. The latest developments in deep learning, particularly Convolutional Neural Networks (CNNs), have realized high-accuracy detection in X-ray, CT, MRI, and histopathology. In the course of reviewing studies published from five years, CNN-based and transfer learning models (ResNet, EfficientNet, InceptionResNetV2) demonstrate more than 90% accuracy and AUCs up to 0.98, which are higher than traditional methods. Hybrid CNNs Transformers with enhance the classification of tumors. however, poor external validation and small and unbalanced data sets decrease the performance. Success in the models is more of quality of data and expert labeling than architecture. Multimodal fusion, explainable AI, and strong validation on clinical reliability should be prioritized in work in the future.

Keywords:

Bone abnormality detection, convolutional neural networks, deep learning, histopathology, transfer learning.

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AI vs AI: A Real-Time Multimodal Deepfake and Risk Detection Framework

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Department of Cyber Security, Chennai Institute of Technology, Chennai, India

Joyce SR
Department of Cyber Security, Chennai Institute of Technology, Chennai, India

Abstract:

Deepfakes, or hyper-realistic synthetic media, can now be created thanks to developments in AI and deep learning. Although these technologies can open up new educational and entertainment opportunities, their misuse puts digital integrity, privacy and Real-time video manipulation tools and AI-generated voices are found everywhere, and now more than ever, there is a felt need for automatic and security at greater risk. In order to detect manipulated media and evaluate viewer authenticity during online interactions, this paper suggests a real-time multimodal framework that combines deepfake image classification, facial and eye tracking and environmental audio analysis.

The suggested system uses an out-of-the-box TensorFlow audio model call YAMNet to monitor the sound environment, a ResNet-based Convolutional Neural Network for classifying fake media and MTCNN for real-time face and eye detection. In deepfake classification, the integrated pipeline achieves 90.78% validation accuracy, demonstrating real-time performance with minimal latency on a standard CPU hardware configuration. The suggested framework offers a simple yet effective method for improving trust in remote evaluations, interviews and digital content verifications.

Keywords:

ResNet, MTCNN, YAMNet, Real-Time Monitoring, Multimodal AI, Audio Analysis, Deepfake Detection.

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AI-Driven Predictive Intelligence for Optimized Renewable Energy Generation and Grid Efficiency

Aswath Kannan M
B. Tech, Student, PSNA College of Engineering and Technology, Tamil Nadu, India

Abstract:

Renewable energy sources are essential for achieving sustainable energy goals and reducing carbon emissions; however, their power generation is highly dependent on weather conditions, leading to fluctuating and unpredictable output. This variability creates major challenges for power grid operators in balancing electricity supply and demand, often resulting in energy wastage, grid instability, and increased reliance on fossil-fuel-based backup systems. To address these challenges, this proposal about an AI-driven renewable energy forecasting system that improves prediction accuracy through intelligent data analysis. The approach integrates historical energy generation data with key environmental factors temperature, humidity, wind speed, and solar irradiance to understand patterns affecting energy output. By applying machine learning techniques and time-based feature analysis, the system effectively captures linear and non-linear relationships between weather conditions and power generation. The evaluated predictive models demonstrate strong forecasting performance, enabling reliable day-ahead energy estimation. These accurate forecasts assist grid operators in making informed scheduling decisions, optimizing energy utilization, and reducing unnecessary dependence on conventional energy sources. By enhancing forecast reliability, the system minimizes energy losses, improves grid stability, and supports efficient energy management. This work emphasizes the role of artificial intelligence in addressing renewable energy intermittency and facilitating the scalable integration of clean energy into modern smart grid systems.

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Insight IQ – A Super Powered Analytical Tool to Empower Domestic Retailers

Dharun M
B. Tech, Student, PSNA College of Engineering and Technology, Tamil Nadu, India

Abstract:

The digital transformation of small retail commodities has become essential to improve operational efficiency and enable data-driven decision-making. However, many domestic retailers still rely on manual bookkeeping sales records, making it difficult to extract meaningful insights using conventional analytics tools. Current business intelligence platforms are often expensive, complex, and unsuitable for non-technical users, creating barriers to adoption. This proposal an AI-powered application designed to automate sales data analysis for small scale commodities. The system enables users to upload sales data in multiple formats without prior data cleaning. An intelligent preprocessing module automatically identifies relevant columns, manages missing or inconsistent values, and adapts to diverse data structures. The platform generates retail-specific dashboards and employs a large language model-based storytelling engine to transform analytical outputs into clear, human-readable insights. An interactive multilingual chatbot provides conversational access to business data in global and regional languages with optional text-to-speech support for improved accessibility. Advanced features such as business health scoring, profit margin intelligence, demand forecasting, climate and festival-based recommendations to Enhance the business gains. By empowering small retail commodities with intelligent insights, the system contributes to sustainable business growth, which in turn plays a vital role in strengthening the local economy and overall GDP.

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Traffic Sign Detection using Attention-Based Yolov8

P. Vaishnavi
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K. Keerthan Kumar
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Abstract:

Traffic Sign Detection (TSD) plays a pivotal role in modern intelligent transportation systems, autonomous vehicles, and advanced driver-assistance systems (ADAS). When cars correctly recognize traffic signs, they can interpret road conditions, follow traffic laws, and ensure driving safety. However, factors like cluttered backgrounds, occlusions, small object sizes, and variations in illumination make TSD challenging. The resilience of conventional machine learning and manually developed feature-based methods is constrained under these dynamic circumstances. This paper presents Sign-YOLO, a lightweight and optimized deep learning model enhanced with Squeeze-and-Excitation (SE) and Spatial Attention modules. It is based on the YOLOv8 architecture. By modeling the inter-channel correlations through SE blocks and using a spatial attention mechanism that weights input feature maps on a region basis, these modules increase the efficiency of feature extraction for the model and improve its ability to identify small or partially-obscured traffic signs under real-world conditions. The model was trained and evaluated on the German Traffic Sign Detection Benchmark (GTSDB) dataset, which contains a variety of different types of environments (i.e., illumination conditions, obscured views and angle of observation).

Keywords:

Traffic Sign Detection, YOLOv8, Squeeze-and-Excitation, Spatial Attention, Deep Learning, Object Detection, Computer Vision, Autonomous Driving, Embedded Systems.

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Care and Cure Hospital Management System

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Abstract:

Healthcare providers are overwhelmed by the vast amount of data they deal with, which encompasses everything from laboratory findings and patients' medical histories to medication stocks, appointments and a variety of documentation. Modern technology has become indispensable for everyone. The situation is becoming increasingly complicated with scattered paper files and numerous software tools. Due to the presence of these people, care costs are higher, treatments are often delayed, and there are also errors made. The quality of care does not seem to be as high as it should be.

The HMS, developed as a web-based management system, serves to integrate hospital administrative functions. It covers patient registration, appointment scheduling as well as staff and doctor management. It manages electronic medical records, pharmacies, lab work and billing, all in one software application. The information is kept consistent by running a unified central database for all departments, with real-time automatic updates. This stops data duplication.

Security is of paramount importance. Role-based access control is crucial in limiting access to patient records. This security method only allows certain individuals with the correct clearance to access the medical information of patients. Compliance and audits are streamlined thanks to the tracking of all activity by audit logs and data movement through encrypted, secure channels. Automatic handling of routine tasks reduces errors and frees up staff by taking care of scheduling, billing, inventory and the production of reports.

Through a series of rigorous tests we have evaluated the system's performance - these included user trials, stress testing, integration checks and unit testing. Overall the hospitals enjoyed smoother running systems, more accurate data, quicker decision-making and patients who were more content. Regardless of the size of your operation, it is designed to be scalable so that it can adapt to future technological advancements and accommodate any expansion of services you may offer.

A web-based, unified Health Management System will significantly simplify healthcare operations. By having a clinical system in place, healthcare professionals are brought closer together, clinical data is locked away securely and decisions are speeded up, which in turn lead to improved patient care.

Keywords:

Healthcare Management System, Sustainable Development Goals (SDG 3), Electronic Health Records (EHR), Telemedicine, Hospital Administration, Interoperability, HL7, FHIR, Data Security, Role-Based Access Control, Public Health Analytics.

Training Agents for Navigation and Behaviour in Dynamic Game Environments Using Unity ML-Agents

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Abstract:

This paper explores the training of adaptive agents in procedurally generated environments using Unity ML-Agents. We compare Proximal Policy Optimization, Behavior Cloning and GAIL under dynamic conditions. Experiments show that the tuned PPO configuration, trained incrementally across multiple stages, achieved superior generalization, reaching a 0.70 training and 0.50 testing success rate. The findings highlight the importance of hyperparameter tuning and staged training for improving agent adaptability in complex environments. We introduce a fully modular environment composed of interchangeable level segments, randomized obstacle layouts, and dynamic route generation, which enables an evaluation under changing conditions.

Keywords:

Reinforcement Learning, Unity ML-Agents, Procedural Generation, PPO, Behavior Cloning, GAIL, Navigation, Dynamic Environments.

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Exploring Higher-Dimensional Intelligence and Real-Time Physical Materialization

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Abstract:

The study presents a theoretical framework which investigates the potential existence of higher-dimensional intelligence that can store matter in remote locations and create physical objects through frequency-based mechanisms. The paper proposes that advanced entities will operate beyond normal spatial and temporal limitations when they store physical items in either different dimensional spaces or energy-based storage systems. The storage system maintains its original state until specific vibrational frequencies or particular coded linguistic elements activate it for access. The research studies how frequency resonance links to information gathering using various techniques encoding which then results in matter translocation while introducing connections to groundbreaking quantum physics theories and multidimensional space models and vibrational energy dynamics. The research studies main focus on two types of activation methods which use sacred words and mantras and divine commands as their basic elements to analyze these methods as controlled access systems which use frequency-based activation protocols. The paper combines scientific speculation with historical and religious references to create a multidisciplinary approach for studying how higher-order intelligence can control matter in different dimensions. The framework exists as a theoretical construct which provides a formal structure to study advanced dimensional physics and consciousness-related frequency interactions and the possibilities of controlling materials from a distance.

Keywords:

Higher-Dimensional Intelligence, Non-Local Matter Manifestation, Frequency-Based Activation, Dimensional Matter Storage, Vibrational Resonance Theory.

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Design and Implementation of an AI Based Adaptive User Interface for Personalized Web Experience

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Abstract:

Addressing the critical need for personalized digital experiences and recognizing the limitations of static interfaces in an increasingly dynamic online environment, this work presents an innovative AI based adaptive user interface system specifically engineered for front-end web application development. The proposed system meticulously analyzes comprehensive user behavior data, encompassing intricate click patterns, navigation paths, time spent on specific pages, and frequently engaged features, to gain a deep understanding of individual user preferences and interaction habits. Employing simple machine learning algorithms, it accurately categorizes diverse user interaction styles into distant profiles. This classification subsequently enables real-time, dynamic adjustments to interface elements such as layout arrangements, strategic content highlighting, and personalized theme preferences, ensuring an optimized, responsive, and highly intuitive user journey. Crucially, the framework is designed with robust ethical considerations at its core, prioritizing explicit user consent for data collection, minimal data acquisition to safeguard privacy, and a comprehensive privacy-aware design philosophy throughout its implementation. This work delivers a practical, implementable solution for AI-powered front-end personalization, effectively bridging the gap between theoretical research and the demanding requirements of real world web applications to foster more intuitive, engaging, and efficient digital interactions for every user.

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An Intelligent System for Identifying Fraudulent Job Advertisements in Online Recruitment

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Abstract:

Online recruitment fraud has been rising with the use of the digital platforms to hire talent, making it easier for the scamers to post fake job advertisements and mislead job seekers; This increasing make it important to detect fake job postings as a major cybersecurity issue. This research is concerned with the process of detecting fraudulent job ads through transformer models of deep learning. In order to resolve the issues with the outdated benchmark data sets, a new set of data is created by integrating job postings from three new sources. Exploratory Data Analysis show the significant imbalance in the classes with fake job postings as small class and hence, models perform poorly in detecting it. In order to overcome the issue, this study deploys ten SMD effective SMOTEs to balance on the data.

Two transformer models, BERT and RoBERTa are tested in the balanced conditions. Both models reveal the performance in competition as competitive. However, BERT combined with SMOBD- SMote obtain the best results in around 90% balanced accuracy and recall. The addition transformer models with appropriate data balancing happens and the impact on identifying fake job postings makes a huge difference.

Keywords:

Recruitment Fraud Online, Deep learning, Transformer Models, BERT, RoBERTa, SMote, class imbalance, Natural Language Processing, Cybercrime Detection

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Image Cartoonization with GAN

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Abstract:

In this paper, our project aims at adopting and studying CartoonGAN [1], a particular Generative Adversarial Network (GAN) that can convert the real photos into cartoon images of high quality. Conventional approaches such as Neural Style Transfer are effective at duplicating textures, and CycleGAN is effective at style translation. They tend to fail when they attempt to retain the characteristics of cartoon paintings, like abstraction, smooth shading, and sharp edges. This research addresses these challenges by developing a simplified GAN model that learns a one-to-one mapping of photographs to cartoon appearances without the requirement of paired training data. The primary contribution of this work is the employment of two precisely crafted loss functions that nudge the network to the target appearance. A novel adversarial loss encourages edge definition through training the discriminator on sharp line art and penalizing blurry ones. This provides the generator with a good reason to produce the crisp lines characteristic of cartoons. To maintain the output consistent with the original image's content, a perceptual content loss is employed. It utilizes the feature space of a pre-trained VGG-19 network, maintaining the top-level structure of the input photograph and permitting a degree of artistic abstraction. The training is also more resilient because of a crucial initialization step where the generator is pre-trained to reconstruct content prior to initiating adversarial training. The end model is configured in an easy-to-use web application, providing an interactive method to display its robust stylization capabilities.

Keywords:

Generative Adversarial Network (GAN), CartoonGAN, image cartoonization, style transfer, adversarial loss, content loss, edge-promoting.

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Silent SOS: A Real-Time Hand Gesture Based Emergency Alert System for the Speech and Mobility Impaired

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Abstract:

Individuals with speech and mobility impairments often face significant challenges in communicating distress during emergency situations. Traditional emergency alert mechanisms largely depend on voice commands or physical interaction, which may not be feasible for such individuals. This paper presents "Silent SOS: A Real-Time Hand Gesture Based Emergency Alert System for the Speech and Mobility Impaired," an intelligent and resilient smart system designed to provide immediate assistance through non-verbal communication. The proposed system employs computer vision and machine learning techniques to recognize predefined emergency hand gestures in real time. Upon detecting a valid gesture, the system automatically triggers an emergency alert containing critical information such as the user's location and time of occurrence, which is transmitted to predefined contacts or emergency services. The model is optimized for high accuracy, low latency, and continuous operation, ensuring reliability even in critical scenarios. By eliminating the need for speech or complex physical actions, the system enhances accessibility and inclusivity while ensuring rapid response during emergencies. The proposed solution demonstrates how modern optimization and technological advancements can be effectively applied to develop resilient smart systems that address real-world safety challenges and improve the quality of life for differently-abled individuals.

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Smart Soft Robotic End-Effector with Real-Time Mechanical Health Awareness

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Abstract:

Soft robotic grippers are widely used in industrial automation due to their ability to safely handle objects with varying shapes and fragility. However, continuous operation causes wear in internal actuation components such as gears, which can reduce reliability and lead to unexpected failures. This paper proposes an intelligent soft robotic gripper with integrated gear wear monitoring. The system uses variable stiffness control to adapt the gripping force according to object properties, while vibration signals from the gripper's gearbox are continuously monitored using low cost sensors. Signal analysis and simple machine learning techniques are employed to detect early signs of gear wear. Based on the detected condition, the gripper operation is adjusted and maintenance alerts are generated. Experimental results show effective object handling and reliable early wear detection, enabling predictive maintenance at the robotic end effector level for intelligent industrial automation systems.

Keywords:

Soft robotic gripper, Gear wear monitoring, Predictive maintenance, Variable stiffness control, Industrial automation.

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A Review and Analysis of Wave Packet Transmission Efficiency in VANET Using Simulation

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Abstract:

The increasing need for mobility, on-road traffic and inefficient traffic management systems have led to the development of many Intelligent Transport Systems (ITS). The core of ITS is the Vehicular Adhoc Networks (VANETs), comprising vehicles with computing abilities. VANETs are established on Mobile Adhoc networks (MANETs) which is the instantaneous generation of a network for mobile devices. The current VANETs ecosystem has several unaddressed issues such as communication challenges (mobility, routing and Quality of Service), scalability and security. In recent years, the demand for IP-enabled smart devices has triggered different applications of infotainment systems. The performance evaluation of wave packet transmission efficiency in VANETs using NS-3 simulation integrated with Simulation of Urban Mobility (SUMO) for realistic mobility modelling is presented in this paper. AODV, DSDV, DSR and OLSR are four routing protocols have been investigated in this study—under varying vehicle speeds and node densities. Several key performance metrics such as WAVE packets sent and received, WAVE packet proportionate and Basic Safety Message (BSM) Packet Delivery Ratio (PDR) are analyzed. Results show that OLSR outperforms other protocols in terms of reliability and scalability, while AODV and DSDV demonstrate consistent performance across scenarios. DSR fails to function effectively, indicating its limitations in high-mobility environments. The main highlights of this study is the importance of selecting appropriate routing protocols for robust VANET communication and provides insights for future research in dynamic vehicular networking environments.

Keywords:

VANET, ITS, WAVE, Routing Protocols, Performance Metrics, Simulation.

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Context-Aware Smart Travel Assistance Enhanced with Pre and Post-Arrival Customer-Specific Requirements

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Abstract:

Most Smart Tourism platforms deliver either pre-trip guidance or on-site guidance separately. This creates a gap when tourists confront unforeseen needs during their trip. The Smart Tourist Guide System addresses this gap by integrating pre-arrival planning, personalized itinerary creation, and post-arrival assistance within a single, unified platform designed specifically for diverse tourist demographics including families, solo travellers, and seniors. The platform provides an elderly-friendly interface with font size adjustment control, guided navigation, and clear layouts for accessibility. The integrated chatbot provides 24/7 support, answering queries about destinations, travel tips, and guidance. Users can explore Indian destinations and discover according to their sense of travel and interests through real-time visualizations from Indian tourism data, which provides more personalized choices. Before arrival, the system enables user to discover personalized destinations and plan their itineraries with respect to their interests and constraints. After arrival, the system assists real-time decision-making by supporting tourists to locate nearby hotels, restaurants, popular attractions, events, weather and emergency services. Although the current execution highlights the front-end prototype, the architecture is designed to integrate artificial intelligence and machine learning components for personalized experience. This paper concentrates on the design objectives, system architecture, prototype realization, and outlines the planned AI/ML extensions.

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A Hybrid Engineering–Administrative Framework for Heat Stress Induced Accident Risk Reduction in the Indian Fireworks Industry

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Abstract:

Fireworks manufacture is one of India's most dangerous industries due to delicate pyrotechnic compositions, physical handling, and intense temperature exposure. Chemical and procedural research have addressed fireworks accidents, but occupational heat stress as a measurable accident amplifier has not been systematically quantified or incorporated into accident risk reduction measures. This study develops and validates an Indian fireworks manufacturing industry Hybrid Adaptive Heat Stress Risk Reduction Framework (HA-HSRRF) to fill this gap. The Petroleum and Explosives Safety Organisation (PESO) analysis of 2008–2025 fireworks accident data identified major ignition routes and dangerous situations. OSHA and Argonne National Laboratory models calculated Heat Index (HI) and Wet Bulb Globe Temperature (WBGT) using NASA POWER meteorological factors for accident dates and locations. More than 95% of accident incidents occurred under NIOSH "Danger" or "Extreme Danger" heat-stress classifications, proving heat stress as a major cause. Thermal exposure modelling (HI, WBGT), probabilistic accident assessment using Fault Tree Analysis (FTA), process-specific thermal job zoning, and control decision logic are combined in the proposed data-driven decision support system. R-based thermal modelling was used to replicate engineering controls such ventilation augmentation, shade structures, evaporative cooling, and cool roofing, followed by NIOSH-recommended work–rest cycles as administrative controls. Simulation findings show HI reductions of 2–6°F, changing various accident situations to lower thermal risk categories. When paired with technical improvements, administrative interventions decreased fatigue-related dangerous acts by 35%, demonstrating substantial synergy. The framework adopts radiant heat shielding, local exhaust ventilation, thermal buffering, and zoning from high-temperature sectors including iron, aluminium, and glass manufacture beyond guideline-based suggestions. The hybrid framework reduces heat stress–induced accident risk in fireworks manufacture and other heat-exposed, high-hazard sectors with a scalable, adaptable, and statistically proven model.

Keywords:

Fireworks Manufacturing, Occupational Heat Stress, Heat Index, Wet Bulb Globe Temperature, Hybrid Risk Reduction Framework, Engineering Controls.

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Ensemble Machine Learning Models for Daily Temperature and Humidity Prediction at Station Level

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Abstract:

Prediction of surface temperature and relative humidity is important for environmental monitoring, local climate change, and event planning at local region. Though older number-based & physics equation's-based methods cover physical details well, they usually fail at capturing small-scale changes seen in single-station records. In this study, ensemble machine learning models are used to predict daily minimum, mean, and maximum air temperature, along with daily mean relative humidity, using long-term surface meteorological data from Kolhapur, India. Random Forest and Gradient Boosting regression models are trained using a group of physically relevant predictors, including surface pressure, dew-point temperature, vapour pressure, wind characteristics, outgoing longwave radiation, and temporal indicators. Model performance is evaluated using self-determining test data and standard statistical metrics. Results showing the strong predictive outcome for all temperature variables, with coefficients of determination exceptional 0.82 meaning 82% of accuracy and root mean square errors below 1.5 °C. Relative humidity in this model run predicted with mainly high accuracy, with the Gradient Boosting model outstretch an R^2 of 0.95 meaning 95 % of accuracy and an RMSE of approximately 4 %. Scatter-plot diagnostics showing the close agreement between predicted values and observed values with minimal methodical bias. The outcome from the model is highlighting the capability of ensemble machine learning methods to consistently predict daily meteorological parameter at station level and highlight their possible as computationally efficient tools for climate analysis and environmental adaptability applications.

Keywords:

Machine learning Algorithms, Gradient Boosting model, Random Forest model, Temperature prediction, Relative humidity prediction, Surface meteorology, Environmental monitoring.

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Offline Multimodal Retrieval-Augmented Generation (RAG) System for Secure Intelligence Environments

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Abstract:

Cybersecurity and intelligence agencies regularly manage various and unstructured information such as documents, images, videos, audio recordings, satellite images, and even written notes. The conventional methods of information-retrieval fail to handle such a heterogeneous information because they are mostly based on key word matching and do not understand the semantics across modalities. Thus, analysts are manually searching and cross-referencing multitask sources to find the information they need, which has a high impact on operational workload, the possibility of human error, and delays in decision-making related to the mission. In order to deal with such limitations, this paper suggests an Offline Multimodal Retrieval-Augmented Generation (MRAG) framework that is specifically aimed at secure and air-gapped settings. The system takes a text, image and audio input, transforms this into unified embeddings and does cross-modal semantic retrieval fully offline. The framework allows evidence-based, context-aware understanding of information and produces coherent and evidence-based outputs by combining a multimodal retrieval engine, fused with an on-device language model, with available retrieved information. Such a traditional architecture ensures a higher level of data confidentiality, does not rely on cloud-based AI services, and provides much better situational awareness to defend, intelligence, and law-enforcement applications. The paper reveals that a complete offline MRAG system has been proven to be technically capable and extremely effective to organizations that need to have their information processed safely, with precision and effectiveness in multimodes.

Keywords:

Multimodal Retrieval-Augmented Generation Systems (RAGS), cross-modal for information retrieval, multimodal embeddings, semantic search and reasoning, on-premise large language models.

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A Non-Invasive Deep Learning Approach for Real-Time Snoring Detection and Sleep Quality Evaluation using U-Net Inspired Fully Convolutional Deep Neural Network

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Abstract:

This work introduces a real-time snoring detection framework that operates on audio recordings captured through a standard smartphone microphone and analyzed using a Vision Transformer-based deep learning model. Designed to function in typical home environments, the system reliably identifies snoring events and achieves a sensitivity of 89%. Using a large, expert-annotated dataset, the model demonstrated a strong correlation (r = 0.97) between predicted and observed snoring proportions. The approach offers an accessible and scalable alternative for continuous, home-based screening of sleep-related breathing disorders. Its lightweight design enables efficient on-device Processing while ensuring user privacy and low-latency operation. The system also shows resilience across various noise conditions and demographic groups, demonstrating its suitability for real-world deployment. Future extensions include integrating multimodal physiological signals and supporting telehealth-driven personalized sleep assessments.

Keywords:

Deep Learning, Snoring Detection, Smartphone Recording, Transformer Networks, Sleep Monitoring, OSA Screening, Acoustic Signal Processing.

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Automated Transaction Reconciliation & Smart Alert System

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Abstract:

The Automated Transaction Reconciliation & Smart Alert System (ATRS) provides a comprehensive reconciliation of all transactions within minutes of completion by automatically comparing wallet ledger entries with matching amounts in a bank statement. The delays and errors that come with manually balancing these two sources of financial data are reduced by the Automated Transaction Reconciliation & Smart Alert System (ATRS). The ability to import and export Excel/CSV files, the automated matching process that supports multiple stages (including pre-processing), the ability to automatically identify duplicate transactions, and the availability of real-time dashboards to view and analyse various statistics related to transactions by each bank are all benefits of utilizing the ATRS system. Additionally, the system offers several ways to automatically notify users of unsolved transactions, such as by email, SMS, and WhatsApp. According to test results, ATRS speeds up transaction reconciliation by over 90%, improving accuracy and anomaly detection while offering a scalable solution for large organizations with significantly higher transaction volumes.

Keywords:

Automated Transaction Reconciliation, Smart Alert System, Financial Data Matching, Anomaly Detection, Real-Time Transaction Dashboard.

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Automated Behavioral Feature Engineering for Early Dropout Prediction in Online Learning Platforms

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Abstract:

The growth of online education has improved access to learning opportunities across the globe but minimising the high dropout rates in online education still pose a challenge. If students do not complete their courses that will impact on their growth and development. This will lead to an underutilization of online educational resources. Therefore, it is important to determine the students who are at risk of dropping out, so that student retention can be improved student retention and ensure a sustainable online education system.

The proposed study suggests a framework for predicting early dropout in online educational courses using Automated Machine Learning (AutoML). Unlike traditional machine learning approaches, which are very human-intensive in terms of feature engineering, model optimization and human expertise. AutoML automates these processes to provide scalable, reliable and repeatable analysis of large and complex educational datasets. The proposed framework utilizes the AutoGluon framework to automatically compare different models, perform feature engineering and optimize hyperparameters based on the digital learning behaviour of students, including parameters like login rates, engagement with educational content and their behaviour in online learning environments.

The experimental evaluation is conducted on the OULAD dataset which has more than 10 million student activity data. The AutoML system identifies the important behavioural factors that are associated with the risk of dropout and uses the best models to improve the accuracy of the prediction. The result of the experiment shows that the proposed system is able to identify nearly 70% of students at risk of dropping out, which is better than the existing machine learning models. The proposed system significantly contributes to the development of the online learning ecosystem and the creation of a skilled workforce through the promotion of student success and completion.

Keywords:

Learning Analytics, Early Dropout Prediction, Automated Machine Learning, Automated Feature Engineering, Virtual Learning Environment (VLE), OULAD Dataset.

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An AI Powered Inclusive Web Assistant for Accessing Government Scheme

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Abstract:

The AI-based Inclusive Web Assistant of Equal Access to Government Schemes is a platform solution that integrates into a single platform and aims at making the discovery and application of the Central and State government welfare schemes in India simpler. The system is also intended to seal the information and access divide among the citizens because of the disjointed portals, complicated eligibility and low levels of digital literacy .It is created as a React-based front and FastAPI-powered back end and powered by a structured database of over 4,000 government schemes sourced by government official portals. The site allows users to search schemes by key words, filters, categories or with a Smart Eligibility Wizard which dynamically assesses user entries to suggest an appropriate scheme.The system is inclusive as it supports many languages, and therefore, users with varying language backgrounds can use it. The recommendations provided by AI can help a user find the relevant schemes according to his profile and needs, and the document requirements guide is a clear example of what paperwork is required when a scheme is needed. The simplified navigation and decision-making process will reduce reliance on intermediaries and ensure that eligibility citizens receive the necessary welfare benefits because of poor navigation or ignorance.

Keywords:

Government Welfare Schemes, Eligibility Matching, personalized recommendation engine, rule based decision support, AI chatbot, multi criteria decision making, weighted scoring algorithm, e-government platform, intelligent web system, user centric design.

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Performance Enhancement of Fake News Detection Using Advanced Machine Learning Approaches

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Abstract:

The reality that social media, blogs, and websites can be utilized by anyone makes a portion of issues. Fake news can be a gigantic issue that can harmed individuals or without a doubt make battle between countries. Spread online, beguiling people into enduring something that is not honest to goodness. It can be hazardous since it can affect what people think and do based on off-base information that spreads all over. That's why it's basic to supervise and control social media. Computer programs that learn can recognize off-base information. This article proposes organizing a way to find fake news by analyzing specific parts of the news. The un-used development can tell the differentiate between fake news and honest to goodness news. Lemmatization is the meth-od of finding the elemental outline of a word employing a reference coordinate. We found many basic centers by utilizing two unmistakable methodologies. Take out the repeated words and the technique utilized to find out how crucial they are. Vector calculation suggests figuring out the comes approximately of counting, subtracting or expanding vectors. We utilized three bunches of data. Available online: Fake-or-Real-News, Media-Eval, and ISOT. We utilized eleven differing ways to add up to the task. The current system: precision, the zone under precision, evaluation, and F1 score. We orchestrate to advance exactness for the Fake-or-Real dataset.

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Security Vulnerability Analysis of Android Applications Used in India

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Abstract:

The sudden increase in the number of Android ap- plications in India has caused serious concerns about the security of applications and the protection of user data, particularly since many applications are dealing with highly sensitive personal and healthcare information. Although secure development guidelines are available, many Android applications are still prone to secu- rity vulnerabilities because of insufficient testing during the devel- opment phase. This paper describes the static security analysis of chosen Android applications in India, which are used by citizens, using the Mobile Security Framework (MobSF). The analysis aims to identify security vulnerabilities in terms of excessive permissions, insecure data storage, exposed application compo- nents, poor cryptographic standards, and Android manifest and source code misconfigurations. The identified vulnerabilities were systematically categorized according to the OWASP Mobile Top 10 security risks to evaluate their severity and impact. Various previous studies have revealed that a substantial percentage of Android applications contain at least one critical or high-severity vulnerability when analyzed using static analysis methods. In line with the existing literature, the findings of this research work are able to establish that MobSF-based static analysis is an effective and efficient method for the early identification of security vulnerabilities in Android applications. The findings of this research work stress the importance of incorporating static security analysis into the Android application development life cycle.

Keywords:

Android Application Security, Static Analysis, Mobile Security Framework (MobSF), OWASP Mobile Top 10.

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AI-Powered Wireless Network Traffic Prediction: A Machine Learning Approach for Proactive Network Management

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Abstract:

Wireless networks have become the backbone of modern communication infrastructure, supporting billions of devices and applications worldwide. With global IP traffic exceeding 396 exabytes per month, managing network congestion and ensuring Quality of Service (QoS) has become increasingly challenging. Traditional statistical models like ARIMA and SARIMA struggle to capture the complex, non-linear patterns inherent in network traffic, resulting in reactive management approaches that address issues only after they occur. This paper presents an AI-powered solution for wireless network traffic prediction using Bidirectional Long Short-Term Memory (Bi-LSTM) neural networks. The proposed system implements a multi-level predictive architecture combining Linear Regression, Random Forest, and LSTM models to balance computational efficiency with prediction accuracy.

Keywords:

LSTM, Network Traffic Prediction, Deep Learning, Time Series Forecasting, QoS Optimization, Wireless Networks, Anomaly Detection.

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Synchronic Forensic Triage: A Distributed Ledger Framework for Volatile Evidence Preservation in the Smart City Edge-Fog Continuum

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Abstract:

I have come to see a disturbing lacuna in our smart city planning: As our cities grow more automated, the digital evidence we need for solving crimes is being deleted right before our eyes and often with the full cooperation of local police departments. Today, we think about forensic data as something gathered after the fact, but in an 'Edge-Fog' world, data is transient and can be deleted in seconds to preserve bandwidth. This creates a forensic vacuum. To address this, in my research I present a Synchronic Forensic Triage (SFT) approach.

Rather than relying on a manual investigation (which may come too late), SFT responds in the digital domain, using localized AI to be our digital first responder. It doesn't attempt to preserve everything — that would be impossible — but rather aims to identify high-value "incident triggers" the second they occur. The system then immutably links (anchors) a cryptographic hash of the data to a local blockchain, generating an irrefutable receipt that proves the integrity of the evidence. This also means even if raw files are deleted to sustain the network, there is still a legally enforceable witness of what happened. In what follows I dismantle the technical hierarchy of that triage process and show that we can safeguard the copying chains without forgoing the expedited sequence on which our cities rely.

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Explainable Artificial Intelligence in Adversarial Cybersecurity: Offensive AI vs. Defensive AI

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Abstract:

In current cybersecurity, AI is being used by both adversaries and defenders. Many defensive systems use AI for intrusion detection and threat assessment, but often the AI models are “black box” models that provide little or no insight into how the decision was reached. Explanatory AI (XAI), which provides insight into the reasoning behind an AI’s decision-making process, has been proposed as a solution to improve the understanding of how AI models make decisions. While explanatory AI may improve the transparency of AI models, it may introduce additional risk if the explanations provided to aid in defensive strategies inadvertently provide valuable information to adversaries.

This research will identify and analyze the security risks of using explanatory AI in adversarial environments. This includes the ability to determine how common explanation techniques, including SHAP and LIME, may potentially assist in model extraction attacks across various types of applications, such as network security, medical diagnosis, and image classification. The research will employ two metrics, Queries-to-Exploit (QTE) and Information Leakage Index (ILI), to measure the effort required to perform a model extraction attack and the amount of information extracted through explanations from an AI model. By analyzing the relationships between explanation techniques, data attributes and the feasibility of model extraction attacks, this research will provide insights into when explanatory AI can be employed securely and when additional protective measures at the system level should be implemented.

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Lightweight Entropy-Guided Self-Healing Defense Framework for Secure AI-Enabled IoT Edge Systems

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Abstract:

The rapid growth of Artificial Intelligence of Things (AIoT) has enabled the deployment of deep learning models in edge applications, such as smart surveillance, autonomous sensing, and traffic management. However, these resource-limited edge systems are highly vulnerable to adversarial attacks, perturbations that are not easily detected can lead to critical failure of AI and edge systems. Conventional defense strategies, like adversarial training, are computationally infeasible for resource-constrained IoT devices, thereby establishing a critical need for efficient and risk-aware security tools.

This paper presents a lightweight defense system that aims to improve the robustness of smart IoT systems against evasion attacks. The proposed methodology combines an Entropy-Guided Detection module, which assesses the uncertainty of the model's softmax output distribution in real-time with negligible computational complexity, to detect high-risk adversarial examples. After an anomaly is detected, the system activates its Self-Healing Mechanism based on spatial smoothing and non-local means algorithms. This intermediate step cleans the tainted data stream, effectively removing adversarial perturbations before they affect the decision-making engine.

Experimental results show that this approach is quite successful in countering standard attacks (FGSM and PGD) while keeping a high level of classification accuracy. Most importantly, low latency is achieved by the low complexity of the purification methods, making this approach suitable for real-time implementation in energy-constrained smart city systems. This work aims to help build robust, resilient, and secure smart systems by incorporating advanced optimization methods with effective AI safety strategies.

Keywords:

Adversarial Defense, AIoT Security, Entropy Detection, Self-Healing Systems, Edge Computing, Resilient Smart Systems.

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Multi-Document Summarization using Clustering Techniques

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Abstract:

Multi-document summarization aims to generate a concise and informative summary from multiple documents covering similar topics while minimizing redundancy and preserving content diversity. With the exponential growth of digital text such as news articles, research papers, and online reports, automatic summarization has become an essential tool for efficient information access. This work presents a multi-document summarization approach based on clustering techniques to identify and organize semantically similar sentences across multiple documents. Initially, the input documents are preprocessed using tokenization, stop-word removal, and lemmatization. Important textual features are extracted using TF–IDF representation. Clustering algorithms such as K-means are then applied to group similar sentences into clusters, where each cluster represents a distinct subtopic. Representative sentences closest to the cluster centroids are selected to form the final summary, ensuring comprehensive topic coverage with minimal redundancy. Experimental evaluation demonstrates that the proposed clustering-based approach produces coherent and informative summaries compared to traditional extraction-based methods. The results indicate improved content coverage and reduced repetition. The proposed system is suitable for applications such as news aggregation, document analysis, and information retrieval systems. In conclusion, clustering-based multi-document summarization provides an effective and scalable solution for handling large collections of related documents.

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ColdGAN: Scalable Synthetic Data Generation for Data-Efficient Cold-Start Learning

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Abstract:

When there isn't a lot of labeled data to work with, especially when the model is new, then there is a big problem for systems that use machine learning and data, which is referred to as cold start problem. This problem gets worse in areas where collecting data is hard, privacy laws are strict, or things change often. The research work here proposes a framework which is GAN-based that produces synthetic data for the enhancement and for the expedition of the learning process in some scenarios where data accessibility is limited.

The proposed method using GAN Based framework which has adversarial training capability helps in extracting the valuable representations that are hidden from the real instances which are available in the limited set. Here we need a model that can produce in large numbers, synthetic data which must be good quality, also consistent, and that produces a high number of attributes and also must be relevant to the data which must perfectly mirror the inputed data that was used for distribution. It is obvious that the proposed method is not similar to traditional methods for data augmentation. It has several benefits which not only increases the size of the sample but also produces a better training dataset that best represents the required synthetic data.

This generated synthetic data is now very useful to train the models in machine learning. Due to this data, new initialization is considered to be in action and also here learning of models and complete process seems more stable. Through thorough work and complete process during various experiments and tests, it has been viewed that synthetic data not only helps in building new models but also helps in speeding up convergence rate and also boosts the predictive performance in different cold start settings. Such systems also improve in generalization when it is compared to baseline systems because they were trained with real data which is available in very less in number. It is easy to manage and handle such frameworks as for different sizes of data and application needs, synthetic data can be generated as per needs.

Hence it is clear that when synthetic data is generated using a GAN based system, it is always very useful and the best way in terms of reliability to fix problems that are faced by cold start systems in real-world applications. There are many areas like recommendation systems, prediction systems, healthcare, and various intelligent systems in which such models are very useful that focus on the requirements of the user. Such study helps in reducing the need of datasets like big labels and generates outputs of machine learning models, deployments more safer and respectful in terms of privacy.

Keywords:

Cold Start Problem, Generative Adversarial Networks, Synthetic Data Generation, Data-Efficient Learning, Scalable Machine Learning, Data Scarcity, Model Initialization, Privacy-Aware Learning.

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Fake News Detection Using Hybrid Feature Engineering and Multi-Class Support Vector Machines

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Abstract:

The rapid development of social media and online news portals has led to the increase in disseminating of fake news, which is seriously questioning the trust and decision-making of general public. Because of the huge digital content source and the no longer feasible manual way of detection, a feature engineering hybrid methodology and optimised multi-class Support Vector Machine MSVM is proposed in this study in order to automate the process of fake news detection. News articles are pre-processed using different NLP techniques, features are then extracted and optimised for efficiency in reducing the dimensionality. An optimised subset of the features is then used in classifier training using MSVM, for accurate classifiers of new to genuine or fake.

The desired balance between accuracy, computational efficiency and interpretability is achieved by using the proposed approach. The optimised MSVM framework can hence turn in competitive performance with lower complexes as compared to the deep learning models requiring large volumes of computation with complete labelled datasets. Validations on benchmark datasets prove that the proposed method is capable of offering reliable results during the detection task based on general performance metrics and, as a consequence, it can also be used in real-life applications in online news verification and social media monitoring systems.

Keywords:

Fake News Detection, Hybrid Engineering of Using Feature, Multi-Class Support Vector Machine, Optimisation of Feature, Natural Language Process Files, Machine Learning, Social Media Analysis.

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Automated Spinopelvic Parameter Measurement in Radiographic Imaging: A Deep Learning–Based Review

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Abstract:

The field of deep learning (DL) has reached a point where researchers can now use automatic systems for studying spinopelvic alignment through radiographic image analysis. The key sagittal parameters which include pelvic incidence (PI) and pelvic tilt (PT) and sacral slope (SS) and lumbar lordosis (LL) and thoracic kyphosis (TK) and sagittal vertical axis (SVA) serve as essential tools for assessing adult spinal deformity. The process of taking these measurements requires manual execution which creates both a lengthy procedure and an increased risk of measurement mistakes by different observers. Researchers developed deep learning (DL) pipelines which use convolutional neural networks (CNNs) for vertebral and pelvic segmentation or anatomical landmark detection which leads to calculation of alignment parameters through geometric measurements. The reported results show that the system achieves performance levels which match those of skilled surgeons with intraclass correlation coefficients (ICC) reaching 0.90 and the system producing mean absolute errors which match interobserver variation. Automated systems now require less time for analysis because they can finish measurements in only seconds for each image processed. The review presents the latest developments in dataset creation and model development and evaluation techniques while it identifies ongoing problems which include anatomical variation and imaging errors and limited ability to apply results in different medical environments. Current research shows that deep learning (DL) methods offer dependable and quick techniques for measuring spinopelvic parameters in research but clinical use requires additional data and thorough validation from outside sources.

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AI-Enabled Analysis of Psychological Factors Contributing to Student Burnout and Mental Health Challenges

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Abstract:

Student mental health has emerged as a critical global concern, with rising cases of academic burnout, anxiety, depression, and emotional distress. Increasing academic pressure, social expectations, competitive environments, and digital isolation have intensified psychological strain among students. Burnout, characterized by emotional exhaustion, depersonalization, and reduced academic efficacy, significantly impacts both academic performance and overall well-being.

This study presents an exploratory analysis of the psychological factors contributing to student burnout while conceptually integrating Artificial Intelligence (AI) as a potential support mechanism. By incorporating AI techniques such as Natural Language Processing (NLP), sentiment analysis, and predictive modeling, there is a possibility to analyze behavioral and emotional patterns in student interactions and identify key indicators of mental distress. The proposed approach focuses on understanding how AI-driven systems can assist in early detection of burnout-related signals and risk-level assessment through data-driven insights, without relying on a fully developed model.

The integration of AI-based smart systems into educational environments can enhance early intervention strategies, reduce counselor workload, and improve overall student well-being outcomes. By combining psychological insights with intelligent technological approaches, this study contributes toward building scalable, non-intrusive, and adaptive support systems, ultimately promoting emotionally safe and resilient academic ecosystems aligned with sustainable societal development.

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An Enhanced Multidimensional Security Framework for Securing PaaS-Based E-Commerce Cloud Environments

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Abstract:

The fast movement to cloud computing has made Platform-as-a-Service (PaaS) one of the most significant enablers of the scalable and agile E-commerce applications. Nevertheless, PaaS environments pose serious security issues because of multi-tenancy, dynamic workloads, shared service elements, and high-performance demands. Traditional security strategies tend to respond to isolated threats and do not weigh the security performance with the operational performance. The given paper offers to introduce the Enhanced Multidimensional Security Framework (PaaS-MSF) that should be used in order to protect the PaaS-based E-commerce cloud environment and maintain the sustainability of its performance.

The suggested framework will incorporate several security aspects such as identity and access control, context-wary risk determination, intrusion detection and response, tenant isolation, compliance monitoring, and performance-conscious enforcement in one architecture. A multi-phase developmental evaluation approach is embraced and integrates organizational survey analysis, stochastic security simulation on StochSS, cloud performance modelling on CloudSim Automation and statistical validation on SPSS. This will allow experimental and reproducible testing under baseline and more secure settings.

As it is evidenced by experimental outcomes, the suggested framework is much better at detecting intrusions, preventing them, and containing threats than traditional PaaS security frameworks. Notably, these security improvements are made with less effect on critical performance indicators like response time, throughput and resource usage. The results indicate that context sensitive and adaptive security enforcement are capable of addressing threats with respect to E-commerce without bringing about unacceptable performance burden.

Altogether, this research brings a validated, performance-conscious, and standards-oriented security framework that will further theoretical and practical knowledge on the topic of PaaS security.

Keywords:

Platform-as-a-Service (PaaS) Security, Multidimensional Security Framework, E-Commerce Cloud Computing, Performance-Aware Security, Stochastic Security Simulation.

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Multimodal and Temporal AI Models for Early Risk Prediction of Neonatal Complications Using Clinical and Textual Data

Ruchita Vyas

Abstract:

Early identification of neonatal complications is critical for reducing infant mortality and improving long-term health outcomes. Traditional risk assessment approaches often rely on limited structured clinical variables and may fail to capture temporal trends and contextual information present in unstructured medical notes. This study proposes a multimodal and temporal artificial intelligence framework that integrates heterogeneous clinical signals—such as vital signs, laboratory measurements, demographic attributes, and longitudinal electronic health record (EHR) notes—to enable early risk prediction of neonatal complications. The proposed approach combines deep temporal modeling with natural language processing techniques to learn dynamic representations from sequential clinical data and contextual embeddings from textual reports. Data preprocessing includes time-series normalization, missing-value handling, and semantic encoding of clinician narratives. The model architecture leverages attention-based mechanisms to fuse multimodal inputs and capture evolving physiological patterns during the neonatal period. Experimental evaluation on retrospective neonatal datasets demonstrates that incorporating textual information alongside structured clinical variables enhances predictive performance, enabling earlier and more reliable identification of high-risk cases compared to unimodal baselines. The findings highlight the potential of multimodal temporal AI systems to support proactive clinical decision-making, optimize resource allocation in neonatal intensive care units, and improve patient outcomes. Future work will focus on explainability, real-time deployment, and ethical considerations for integrating AI-driven risk prediction into clinical workflows.

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Mobility-Aware and Energy-Centric Hybrid Dynamic Clustering Protocol for Wireless Sensor Networks

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Abstract:

Wireless Sensor Networks (WSNs) are widely used in applications such as environmental monitoring, healthcare, smart cities, and industrial automation. Sensor nodes are typically energy-constrained and often deployed in remote environments, making energy-efficient communication protocols essential for extending the network lifetime. Clustering-based routing protocols reduce energy consumption by organizing nodes into clusters and selecting cluster heads for data aggregation and transmission. However, most existing clustering protocols assume static node deployments, which limits their performance in mobile network scenarios.

This paper proposes a Mobility-Aware and Energy-Centric Hybrid Dynamic (MAECH-D) clustering protocol for mobile wireless sensor networks. The proposed protocol integrates residual energy, displacement-based mobility estimation, and proximity to the sink to select stable and energy-efficient cluster heads. By prioritizing nodes with lower mobility and higher residual energy, MAECH-D improves cluster stability and reduces communication link failures.

Extensive simulations are conducted on large-scale network deployments with 500 sensor nodes. Performance evaluation in terms of network lifetime, stability period, number of live nodes, and residual energy preservation shows that MAECH-D significantly outperforms existing protocols such as LEACH-C, SEP, and MSECHP. The results demonstrate that the proposed protocol is suitable for scalable and energy-efficient mobile wireless sensor network applications.

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Hybrid Method for Multimedia Search in Large Databases

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Abstract:

The rapid growth of multimedia databases demands efficient retrieval systems capable of handling millions of high-dimensional image embeddings. Traditional exact nearest neighbor search becomes infeasible at scale due to quadratic time complexity, while deep CNN features provide semantic richness at high computational cost. This work presents a hybrid retrieval framework combining pre-trained ResNet CNN embeddings with FAISS approximate nearest neighbor (ANN) indexing via inverted file (IVF) structures and product quantization. Images from the MS COCO dataset are processed through global average pooling and L2 normalization to yield compact 2048–dimensional vectors, indexed offline for sub-linear query times. Experiments on a 100K-image database with 5K queries demonstrate optimal trade-offs: medium-compression IVF+PQ achieves Recall@10 of 0.794 and mAP 0.572 at 8.3ms latency (93% faster than exact search's 128ms) and 198MB index size (81% memory reduction from 1024MB). Varying probed clusters (nprobe=1–16) tunes accuracy from 0.741 to 0.813 Recall@10. High-compression variants maintain viable 0.762 Recall@10 at 4.9ms and 124MB. Unlike novel algorithm proposals, this system emphasizes reproducible integration of established components, providing practitioners with configurable accuracy-efficiency balances for surveillance, e-commerce, and edge computing. Results validate the framework's scalability for real-world deployment.

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Spatio-temporal Resolution and Aggregation Effects in Urban Air Quality Assessment: A Systematic Review (2015–2025)

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Abstract:

Urban air quality measurement and analysis have evolved significantly over past decade with extensive use of monitoring sensor networks and data analytic methods. An important yet under utilized dimension in these methodologies is the influence of temporal and spatial resolution of air quality data aggregation strategies specifically its interpretation, accuracy and policy relevance. This systematic review synthesizes peer-reviewed literature published between 2015 and 2025 to examine how temporal granularity—from sub-hourly sensor observations to annual averages—and aggregation approaches affect urban air quality analysis outcomes.

Relevant studies were identified across various major scientific databases and categorized according to monitoring modality, pollutant type, temporal scale, and analytical application. The review reveals that fine temporal resolution datasets enhance the detection of short-term pollution episodes, traffic-driven variability, and diurnal emission signatures, thereby improving predictive modelling and real-time decision support. Conversely, aggregated datasets provide stability for long-term trend analysis, epidemiological inference, and regulatory reporting but may obscure peak exposures and intra-day variability. Emerging hybrid approaches combining multi-scale temporal integration and sensor fusion demonstrate potential to reconcile these trade-offs, enabling more robust urban exposure characterization.

The synthesis further highlights methodological inconsistencies in temporal aggregation practices, limited reporting of uncertainty propagation, and gaps in standardized evaluation metrics across studies. These findings underscore the necessity for harmonized temporal data frameworks and context-aware aggregation strategies tailored to specific urban air quality objectives. By consolidating current evidence, this review contributes a structured understanding of temporal scale effects in air quality science and outlines research directions for multi-resolution analytics, integrated monitoring architectures, and policy-aligned assessment methodologies. The outcomes are expected to support researchers, practitioners, and urban planners in designing temporally informed air quality monitoring and analysis systems.

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ResNet-50 Powered Mobile Framework for Childhood Malnutrition Detection and Intervention Using Facial Imaging

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Abstract:

Childhood malnutrition is a condition caused by inadequate intake of nutrients, leading to stunted growth, underweight, or wasting in children. It weakens immunity, affects cognitive development, and increases disease risk. The current state-of-the-art childhood malnutrition detection system uses CNN architectures such as ResNet-50, EfficientNet-B4, VGG16, and AlexNet to classify facial images into normal, at risk, and severely malnourished categories. Preprocessing includes resizing, flipping, zooming, and face detection via MTCNN. Among the models, ResNet-50 achieves the highest accuracy of 92%, outperforming others in precision and consistency. However, the system's reliance on curated datasets limits its generalizability across diverse populations. Models like AlexNet and VGG16 show reduced accuracy in identifying normal nutritional status, revealing architectural constraints. Additionally, dependency on high-quality images and computational resources hinders deployment in under-resourced settings. The proposed solution integrates the ResNet-50 model into an Android-based mobile application developed with Flutter and supported by AWS infrastructure. It features user management, nutritional analysis, personalized recommendations, and educational content. Optimizations via Amazon S3 and RDS ensure scalable, secure, and efficient performance, even on low-cost devices. This deployment broadens access to AI-driven malnutrition assessment and supports real-time interventions, with large-scale validation planned to enhance global applicability.

Keywords:

Malnutrition, ResNet-50, EfficientNet-B4, VGG16, and AlexNet, AWS infrastructure, Amazon S3 and RDS, Preprocessing, generalizability.

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Algorithm Optimization and Feature Engineering for Renewable Energy Stock Prediction in India: An Elastic-Net Regression Framework

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Abstract:

Renewable energy research in India is critical to providing energy security, reducing reliance on fossil fuels, and achieving long-term economic and environmental improvement. Precise stock price prediction in the renewable energy sector is crucial for optimizing investment choices, improving market returns, and facilitating India's shift to a clean energy economy. The nation aims to become a global leader in renewable energy, with forecasting models serving a vital function in directing investors, enterprises, and government towards sustainable development.

This study optimizes Elastic-Net regression models for NHPC, Reliance Industries, Tata Power, and Borosil Renewable by systematically tuning hyperparameters and engineering dataset features including volatility indicators, market capitalization metrics, technical indicators, and temporal features. Through comprehensive feature selection and algorithm optimization, our results indicate that Forecast Distance Modeling with Differencing (FDM + Diff) achieves enhanced accuracy by leveraging optimized feature sets, whereas hybrid alpha regularization with optimized parameters proves effective for NHPC's smaller dataset.

Our optimization framework identifies the most predictive features for each stock, including moving averages, RSI, trading volume, and sector-specific indicators, while fine-tuning regularization parameters (alpha and L1-ratio) to prevent overfitting and improve generalization. These findings underscore the significance of algorithmic optimization and feature engineering for customized models that enable optimal resource allocation in India's growing renewable sector. India's leadership in clean energy will be enhanced by strategic forecasting through optimized predictive models, which will accelerate the transition, reduce financial risk, and motivate global sustainability initiatives.

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Flight by Hand: A Vision-Based Drone Control System with Virtual and Real-world Implementations

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Abstract:

Unmanned Aerial Vehicles (UAVs) have been widely adopted in many fields, including surveillance applications, cinematography, inspection applications, and emergency response. However, traditional joystick-based controllers come with a high learning curve and serious safety hazards, especially for inexperienced operators. Recent efforts have gone into alternative mechanisms of human-drone interaction, such as wearable sensors, vision-based gestures, and multimodal interfaces. In this paper, a low-cost vision-based drone control system is presented, which allows intuitive drone flight control based on real-time captured, two-handed gestures using a standard web camera. The proposed system is based on a Virtual-to-Reality (V2R) development pipeline. At first, gesture recognition and control logic are tested in the virtual environment using OpenCV and MediaPipe. Subsequently, the tested controller is installed on a physical Pluto drone with safety constraints. Experimental results show reliable gesture tracking, stable control behavior and successful real-world flight, securing the verification success of simulation-based validation for safe and accessible drone operation

Keywords:

Human Drone Interaction, Gesture Control, Computer Vision, UAV Control, Virtual to Reality, MediaPipe.

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Multi-Class Brain Tumor Classification from MRI Using Uncertainty-Aware and Explainable Deep Learning

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Abstract:

Accurate multi-class brain tumor classification via magnetic resonance imaging (MRI) is complicated by inter-patient variability, indistinct tumor margins, and discrepancies in imaging equipment and acquisition techniques. This research describes a deep learning-based system for the classification of multi-class brain tumors utilizing MRI imagery. The proposed method employs an EfficientNet-B0 backbone augmented with boundary-aware feature learning and attention techniques to enhance the differentiation among glioma, meningioma, pituitary tumor, and non-tumor categories. To address class imbalance and improve generalization, data augmentation, class-weighted loss functions, and stratified cross-validation are used during training. Also, during inference Monte Carlo dropout is employed to determine the degree of uncertainty in prediction which, in turn, increases the reliability of model predictions for clinical decision-making. The performance of the proposed framework was significantly stronger than that of the conventional convolutional neural network (CNN) baselines in terms of classification and inter-class confusion reduction according to the experimental evaluation on a public brain MRI dataset. Grad-CAM++ and SHAP were responsible for model interpretability improvement, which gave visual and pixel-level explanations by pointing out clinically relevant tumor areas that affected the model's predictions. In addition, a prototype graphical user interface is developed to demonstrate the practical applicability of the proposed system by providing real-time predictions, confidence estimates, and visual explanations, supporting its potential use as a clinical decision making tool.

Keywords:

Brain tumor classification, deep learning, uncertainty estimation, explainable artificial intelligence, MRI.

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Blood Banking System Using Cloud Computing

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Abstract:

The need for safe and accessible blood is a key component in healthcare systems globally. Yet, traditional blood bank management methods tend to suffer from scattered data, restricted accessibility, time lags in emergency response, and inefficient donor–recipient matching. These issues demonstrate the imperative for a more intelligent, clearer, and expandable solution. In order to tackle these challenges, this project is suggesting a Cloud-Based Blood Banking System that utilizes the advantage of cloud computing for changing the nature of blood bank management and access. Features like automated SMS/email notifications of low stock, reminders for donor eligibility, and emergency blood request alerts provide prompt responses as well as active management of blood supplies.

Cloud computing increases scalability, availability, and affordability by doing away with reliance on local infrastructure while providing secure storage as well as fast retrieval of data. The system also provides sophisticated search and filtering capabilities to efficiently match donors with recipients according to blood type, location, and availability. By closing the demand-supply gap for blood, the system shortens turnaround times in emergency situations, lessens wastage, and enhances transparency. In essence, the Cloud-Based Blood Banking System saves lives by offering an intelligent, expedient, and dependable platform for blood management, enabling healthcare facilities to efficiently meet emergency as well as regular demands.

The system leverages cloud computing to ensure real-time access, data synchronization, and scalability, enabling hospitals, blood banks, and patients to access updated information anytime and anywhere. Key modules include donor and recipient data collection, secure cloud storage, automated processing, donor–recipient matching, and real-time notifications through SMS, email, or in-app alerts. Advanced features such as reporting, analytics, and feedback mechanisms further improve decision-making and service quality. By integrating technologies such as AWS cloud services, MySQL databases, and web/mobile interfaces, the platform offers cost efficiency and robust security.

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Image Generation Using Generative Adversarial Networks

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Abstract:

It is also possible to create very natural synthetic images with the help of Generative Adversarial Networks (GANs) with the help of a random noise and a discriminator that can distinguish the real image or a fake one. It is the stimulating process to the generator to repeat fines details like textures , shapes and statistical figures of real pictures and these results are often deceptive to a human eye. This paper will address the architecture of GANs and how they learn, evaluation procedures, and the issue of ethical issues and current such innovation as StyleGAN and its use in computer vision and deepfakes. Learning complicated distributions with adversarial models resolves the issue of picture creation, which is impossible to differentiate between genuine photographs and GANs enhanced pictures. The first is to explore the stability of training, achieve more realistic training using more complex loss functions such as Wasserstein and resolve problems such as mode collapse. In addition to evaluating the improvements in the form of such measures as Frichet Inception Distance (FID), the paper also reviews the way forward, such as hybrid GAN-diffusion models. The paper contains a close taxonomical view of GAN architectures until BigGAN and their operation of improving feature extraction and their perception quality. Such possible threat as misinformation is referred to in the ethical discourses and suggests the methods of its detection.

Keywords:

Generative Adversarial Networks (GANs), Image Generation, Adversarial Learning, StyleGAN, Fréchet Inception Distance (FID), Deepfakes.

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Explainable Artificial Intelligence-Based Identification and Prediction of Brain Tumors Using Medical Imaging

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Abstract:

Purpose: Accurate and early identification of brain tumors is crucial for effective clinical intervention. Although deep learning models have demonstrated high accuracy in medical image analysis, their black-box nature limits clinical trust and adoption. This study aims to develop an explainable artificial intelligence (XAI)-based framework for reliable brain tumor identification and prediction using medical imaging.

Methods: A comprehensive deep learning framework is proposed using magnetic resonance imaging (MRI) data. Multiple models, including a custom Convolutional Neural Network (CNN) and transfer learning architectures such as VGG16, ResNet50, and EfficientNet-B0, are implemented and evaluated. Robust preprocessing techniques, including skull stripping, normalization, and data augmentation, are applied. Explainability is integrated using Gradient-weighted Class Activation Mapping (Grad-CAM) to visualize model decision regions.

Results: Experimental results demonstrate that transfer learning models outperform the custom CNN, with EfficientNet-B0 achieving the highest accuracy of 95.1%. The proposed XAI integrated framework not only improves classification performance but also provides clinically meaningful visual explanations, enhancing transparency and trust. Statistical analysis confirms the significance of performance improvements over baseline black-box models.

Keywords:

Explainable Artificial Intelligence, Brain Tumor Detection, Medical Imaging, Deep Learning, MRI, Grad-CAM, Smart Healthcare.

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Mediaid+: AI-Driven Disease Prediction With Geo-Location Based Doctor and Drug Recommendation with Xai

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Abstract:

Artificial intelligence (AI) is a new tool that has been used to enhance the diagnosis of diseases and access to healthcare services. The paper introduces the MEDIAID+, a medical AI-based healthcare system to predict the disease based on textual symptoms and medical imagery, as well as to recommend a doctor and drug based on geo-location. The suggested system will use machine learning algorithms like Random Forest and XGBoost to process symptom-related data, and deep learning algorithms of the Hugging Face framework to process medical images. In managing the absence of transparency in traditional AI healthcare systems, Explainable AI (XAI) methods are integrated to offer interpretable insights into the results of the predictions on the basis of feature importance and visual explanations. Moreover, the system suggests local medical workers and pharmacies dynamically depending on the geographical position of the user and gives specifics of the medicines, their dosage, and possible side effects. Experimental comparison shows good predictive ability, enhanced interpretability, and effective real time recommendations. The proposed MEDIAID+ will fill the gap existing between the AI-based prediction of diseases and the actual healthcare delivery by providing a transparent, accurate, and user-centered solution fit to be applied to the contemporary digital healthcare applications.

Keywords:

Artificial Intelligence, Disease Prediction, Machine Learning, Deep Learning, Explainable AI, Geo-Location Services, Medical Image Analysis, Drug Recommendation, Healthcare Informatics, Intelligent Diagnostic Systems.

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Implementation and Verification of AMBA Based AHB to APB Bridge for SoC Interconnects using Verilog HDL

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Abstract:

The increasing complexity of System-on-Chip (SoC) designs demands efficient and standardized interconnect architectures for seamless integration of heterogeneous components. AMBA is a widely adopted on-chip interconnection standard that enhances IP reusability and simplifies communication between system modules. In this work, an AHB to APB Bridge is designed and implemented to enable communication between high-performance AHB masters and low-speed APB peripherals. The bridge translates AHB transactions into APB-compliant operations while ensuring protocol correctness and efficient data transfer. The design is implemented using Verilog HDL with emphasis on low latency and optimal resource utilization. Functional verification is performed using simulation-based test benches, validating the correctness and reliability of the proposed bridge for SoC interconnect applications.

Keywords:

AMBA Protocol, AHB, APB, Verilog HDL, Interface, testbenches, SoC, Architecture, Bridge, Master, Slave.

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Machine Learning Based Network Traffic Classification Methods to Secure Wireless Sensor Networks- A Review

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Abstract:

The volume of data that is being shared online is growing along with the number of devices connected to the internet. This enormous volume of data transmission, which also includes malicious data must be handled by a network. Consequently, it is crucial to analyze network data in order to differentiate between regular and malicious traffic. Although a number of solutions, including machine learning techniques, have been proposed, there are still a number of issues that require consideration. This paper provides an extensive review of network traffic classification methods and security protocols designed explicitly for Wireless Sensor Networks (WSNs). Although a number of solutions, including machine learning techniques, have been proposed, there are still a number of issues that require consideration. It talks about how different approaches handle traffic analysis, ranging from conventional port-based and deep packet inspection techniques to contemporary machine learning techniques to. In order to safeguard WSNs from a wide range of threats, this paper also explores important security protocols that guarantee confidentiality, integrity, authenticity, and availability. An overview of the literature on different machine learning methods for traffic classification is also included in this paper.

Keywords:

Wireless Sensor Networks, Network Traffic Classification, Machine Learning, Network Security, Intrusion Detection.

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Retrival Augmented Generation for Healthcare

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Abstract:

The exponential growth of medical knowledge, clinical guidelines, and electronic health records (EHRs) poses challenges for clinicians in accessing accurate and relevant information quickly. Conventional AI language models provide generative capabilities but often suffer from hallucinations and lack domain-specific accuracy. This paper proposes RAG-Health, a novel framework that integrates Retrieval-Augmented Generation (RAG) with structured and unstructured healthcare data to provide reliable, explainable, and context-aware recommendations. The system employs dual-stage architecture: a retriever module dynamically searches patient records, clinical protocols. Unlike traditional LLM-based approaches, RAG-Health ensures outputs are grounded in verified medical sources, enhancing trust and reducing diagnostic errors. RAG-Health represents a scalable, explainable, and adaptive AI system, offering a significant step toward intelligent healthcare augmentation.

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Smart Manufacturing, Operations Strategy and Supply Chain Resilience

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Abstract:

Introduction: Smart manufacturing, operations strategy, and supply chain resilience are deeply interconnected concepts that together shape modern industrial competitiveness. Smart manufacturing leverages advanced technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), robotics, and real-time analytics to optimize production systems. When integrated with a robust operations strategy, these technologies align manufacturing outputs with strategic business objectives, improving efficiency and adaptability. The resulting synergy enhances supply chain resilience—the ability to anticipate, adapt to, and recover from disruptions like pandemics, natural disasters, or economic shocks. As industries face increasing volatility, digital transformation offers a path toward flexible, intelligent, and sustainable systems that promote business continuity, efficiency, and long-term competitiveness.

Methodology: The research adopts a qualitative approach, drawing insights from empirical studies, conceptual frameworks, and case analyses. Data were gathered from secondary sources such as verified industry reports, journal articles, and reputable online publications. Several firms adopting Industry 4.0 practices were studied to observe how smart technologies improve operational efficiency and supply chain resilience. The study also reviewed models linking smart manufacturing with strategic planning and resilience development. This triangulated methodology provides a comprehensive understanding of how digital integration strengthens business operations and sustains competitive advantage.

Analysis & (Probable) Key Findings: Smart manufacturing, as defined by the National Institute of Standards and Technology (NIST), represents "fully integrated, collaborative manufacturing systems that respond in real time to meet changing demands in factories, supply networks, and customer needs." This marks the essence of Industry 4.0—the Fourth Industrial Revolution—driven by cyber-physical systems and intelligent automation. The research identifies major technologies in this domain, including Industrial IoT, AI, robotics, digital twins, blockchain, and predictive analytics. These tools collectively enhance efficiency, agility, and quality control. Companies like Leonhard Group, AMPERE, Geographe, and Smart Press Shop exemplify real-world implementations of these advancements.

Operations strategy serves as the foundation that connects technological adoption with organizational objectives. It involves managing production systems, facilities, technologies, and resources through perspectives like top-down planning, market-based adaptation, and competitor benchmarking. The 5Ps of operations—product, process, plant, partners, and performance—guide strategic alignment.

Finally, supply chain resilience emerges as a vital outcome of this integration. By embedding AI, machine learning, blockchain, and digital twins, firms can achieve enhanced risk management, cost reduction, and sustainability. The COVID-19 pandemic underscored the value of resilience, as industries like semiconductors experienced severe disruptions. The findings suggest that smart technologies strengthen resilience by improving visibility, adaptability, and decision-making.

Discussion and Implication: The study reveals that integrating smart manufacturing within operations strategy transforms businesses from reactive to proactive systems. It creates data-driven environments capable of responding instantly to changes in demand, resource availability, or external shocks. The implications are significant for managers, policymakers, and technology providers. For managers, digital integration enhances performance metrics and competitiveness.

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Policymakers gain insights into how to support Industry 4.0 adoption for sustainable growth. Moreover, technological innovation improves both environmental and operational outcomes by reducing waste and optimizing energy use. Overall, the findings highlight the strategic necessity of aligning digital transformation with resilience planning to ensure long-term sustainability.

Conclusion: Smart manufacturing supported by an effective operations strategy forms the backbone of a resilient and competitive supply chain. By utilising AI, IoT, robotics, and predictive systems, organizations can improve efficiency, sustainability, and agility. This alignment ensures better use of resources, faster recovery from disruptions, and continuous innovation. The research concludes that businesses integrating smart technologies with strategic operations gain a distinct advantage in volatile environments. As global uncertainty persists, investing in digital resilience is not merely an option—it is a necessity for enduring success.

Keywords:

Smart Manufacturing and Industry 4.0 Technologies, Operations Strategy and Production Management, Supply Chain Resilience and Management, Sustainable and Agile Operations, Digital Transformation and Technological Innovation.

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Review of Analyzing Malicious Behavior of Insider Users To Mitigate Threat in Cyber Security

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Abstract:

Today in fast but with no options, using latest technology in any organisation whether Government Department , Private entities or may it be a small entity with small setup is evitable. All of these are prone to insider threats with significant risk to their business security due to the authorised provided access privileges to internal users. This study analysis the two thing – one is insider users social behavior's which compels to changes the intention of dedicated user and another is the technical use of system by same insider users with privileged given to him. In this study First the behavioral attitudes of insider users is calculated by using Primary datasets comprising their social behaviors (collected by survey responses, interviews) and secondly comparing the same insiders technical behaviors by means of secondary datasets, specifically the CERT R5.2 dataset. Use of Principal Component Analysis (PCA) on primary dataset to reduce the dimensionality of large datasets by preserving as much information so that the data becomes easier to process, visualize, and analyze, followed by authenticating insider risk profiles using various machine learning algorithms (such as logistic regression, random forest, and support vector machines). While for secondary dataset, to find the anomaly detection and prediction accuracy Gradient Boosting analysis is to be used. This use of collected Social behaviors pattern as primary data and technical indicators like logon, file access from secondary datasets is definitely give strong reasons to enhances the reliability of insider risk profiling. The outcome will set example that when behavioral science attitude combined with advanced machine learning techniques a system can be devised against insider misuse. Also the primary dataset can be analyzed as to what remedial action the administration has to take to mitigate the insider users threat.

Keywords:

Behavioral Attitude Analysis / Primary Dataset / CERT R5.2 Dataset / Principal Component Analysis (PCA) / Machine Learning Algorithms / Gradient Boosting / Risk Profiling.

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Real-Time Defense Against Phishing Attacks: A Random Forest-Based Detection Model with Alert Mechanism

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Abstract:

Phishing attacks are a major online threat where attackers use fake websites to steal personal information like passwords and credit card details. This paper presents a phishing URL detection system using the Random Forest machine learning algorithm. We used a data set with 32 important features extracted from URLs to train and test the model. Our Random Forest model achieved a high accuracy of 96.83%, outperforming other models like Support Vector Machines (SVM) and Decision Trees.

The system works in real-time to check URLs as users click on them. If a phishing URL is detected, the system immediately alerts the user with a pop up message and a warning sound. This helps users avoid dangerous websites without needing technical knowledge.

We also propose integrating this detection system as a browser plugin for Chrome and Firefox to provide continuous protection while browsing. The paper discusses the performance comparison, feature importance, and future improvements such as live URL checking and exploring deep learning methods to make the system even more accurate and reliable.

This research shows that machine learning, especially Random Forest, can be an effective tool for protecting users against phishing attacks and improving online security.

Keywords:

Phishing, Machine Learning, Random Forest, Cyber security, Real-time Detection, URL Classification.

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Exploring Higher-Dimensional Intelligence and Real-Time Physical Materialization

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Abstract:

The study presents a theoretical framework which investigates the potential existence of higher-dimensional intelligence that can store matter in remote locations and create physical objects through frequency-based mechanisms. The paper proposes that advanced entities will operate beyond normal spatial and temporal limitations when they store physical items in either different dimensional spaces or energy-based storage systems. The storage system maintains its original state until specific vibrational frequencies or particular coded linguistic elements activate it for access. The research studies how frequency resonance links to information gathering using various techniques encoding which then results in matter translocation while introducing connections to groundbreaking quantum physics theories and multidimensional space models and vibrational energy dynamics. The research studies main focus on two types of activation methods which use sacred words and mantras and divine commands as their basic elements to analyze these methods as controlled access systems which use frequency-based activation protocols. The paper combines scientific speculation with historical and religious references to create a multidisciplinary approach for studying how higher-order intelligence can control matter in different dimensions. The framework exists as a theoretical construct which provides a formal structure to study advanced dimensional physics and consciousness-related frequency interactions and the possibilities of controlling materials from a distance.

Keywords:

Higher-Dimensional Intelligence, Non-Local Matter Manifestation, Frequency-Based Activation, Dimensional Matter Storage, Vibrational Resonance Theory.

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An Intelligent Machine Learning Framework for Cyber IoT Network Intrusion Detection System

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Abstract:

The impressive growth of Internet of Things (IoT) networks has posed severe security threats as their architecture is heterogeneous, data generation is large-scale, and it is prone to various cyber-attacks. Conventional intrusion detection systems (IDS) cannot be effective in these dynamic environments in terms of their detection accuracy and toughness. In this paper, a new ensemble-based intrusion detection model will be offered, which will combine alien machine learning and deep learning classifier to improve the detection in IoT networks. The suggested model is a combination of Decision Tree (DT), Random Forest (RF), XGBoost, and Convolutional Neural Network (CNN) with a confidence-based soft voting model, as well as with the help of Mutual Information feature selection to minimize redundancy and computational complexity. To have generalization towards a variety of attack cases, a hybrid dataset was built based on CICIDS2017, NSL-KDD, and IootID20, CIC-IoT2023, and ransomware traffic, that is, a broad collection of contemporary IoT cyber threats. The system was tested in both binary and multi-class classification conditions with the common performance metrics such as accuracy, precision, recall, F1–score and ROC-AUC. The experimental findings indicate that the suggested ensemble model is always more successful compared to single classifiers. It has an accuracy of 99.08, a precision of 99.07, a recall of 99.08 and F 1 -score of 99.07 in multi-class classification, whereas it achieves better performance than the traditional machine learning models. The ensemble also has high discriminative strength with ROC-AUC of 0.955, which is a confirmation that the ensemble is strong to discriminate normal and malicious traffic. The results confirm that heterogeneous learning that combines features selection is an important step in the enhancement of detection accuracy, stability, and generalization in complex IoT scenarios. This study provides a scalable and stable IDS system that can support various cyber-attack patterns, which can be considered a practical base of secure IoT systems.

Keywords:

Intrusion Detection System (IDS), Machine Learning, Cybersecurity, Network Traffic Analysis, Anomaly Detection, Supervised Learning, Feature Selection, Cyber Attacks.

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AI Powered Emotional Wellness Companion: A Virtual Therapist with Multimodal Interaction

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Abstract:

The increasing rate of stress, anxiety, and depression, and the absence of immediate mental health support, highlight the importance and need for a thoughtful, accessible, and empathetic digital mental health solution. In this project, a mental health assistant named EmoAI is proposed as a multimodal mental health assistant based on AI technology, which can assist individuals in dealing with mental health issues immediately, facilitating text communication, voice communication, and video communication. Additionally, the proposed solution is based on a Large Language Model (LLM) and a Retrieval-Augmented Generation (RAG) approach.

In brief, the proposed system design is a web-based user interface facilitating chat, speech, and video communication, an RAG layer to fetch relevant empathetic responses from a carefully filtered data set of mental health responses and an optimized LLM to generate short, soothing, and human-like responses. Additional features include speech recognition, text-to-speech, and video communication with native video interaction using AI speech with video avatar technology.

The data processing pipeline employs semantic matching and contextual grounding with reference to conversational data based on mental health conditions to offer resolution to conditions such as generalized anxiety, depression, panic disorders, and social anxiety disorders in a more emotionally relevant way. The experiments performed in this project show improved fluency in conversation.

Keywords:

AI mental health assistant, Large Language Models (LLMs), Retrieval-Augmented Generation (RAG), multimodal interaction, empathetic conversational AI, real-time emotional support, preventive mental healthcare.

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A Deployment-Aware Comparative Study of Lightweight Models for Human Activity Recognition under TinyML-Constrained Edge Devices

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Abstract:

Human Activity Recognition (HAR) is widely used in personal and industrial devices. Edge devices utilizing TinyML- class microcontrollers face strict constraints in memory, energy, and computational resources. While deep neural networks are frequently adopted to achieve high-accuracy performance, their larger parameter counts hinder deployment on TinyML- constrained hardware. This paper presents a deployment-aware comparative study of lightweight models for sensor (accelerometer) based HAR under realistic TinyML conditions using the Wireless Sensor Data Mining (WISDM) accelerometer dataset. Through sliding window segmentation, statistical time domain features are extracted and evaluated using multiple classical machine learning models, including Decision Trees, Logistic Regression, and Naive Bayes, along with a shallow neural network quantized to INT8 precision using TensorFlow Lite. The models are analysed with respect to accuracy, memory footprint, and relative computational cost to examine practical deployment trade-offs. Experimental results show that Logistic Regression achieves the highest accuracy of 85.64% while maintaining a small memory footprint of 1.62 KB, demonstrating a strong balance between performance and resource efficiency. The quantized MLP achieves comparable accuracy (83.22%) with a memory footprint of 2.91 KB, while significantly reducing model size compared to its FP32 counterpart. These findings support the need for deployment-aware evaluation and contribute toward more informed model selection strategies for microcontroller-based TinyML-constrained systems, where resource efficiency is as critical as predictive performance.

Keywords:

TinyML, Human Activity Recognition, Edge AI, Lightweight Machine Learning, Model Deployment.

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A Comprehensive Review of Botnet Detection Techniques Using Network Traffic and Machine Learning

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Abstract:

Botnets remain a serious threat to the cybersecurity world by supporting massive malicious activities like distributed denial of service (DDoS) attacks, phishing, and data exfiltration. Conventional signature-based detection techniques have become less reliable against modern botnets that use encryption, Domain Generation Algorithms (DGA), and Fast-Flux. This review discusses the current state of botnet detection techniques using network traffic analysis and machine learning. Traditional machine learning algorithms, such as Decision Trees and K-Nearest Neighbors (KNN), have moderate performance with accuracy between 85% and 92%, while optimized DNS-based KNN techniques reach an accuracy of about 97%. Hybrid classifiers developed for fast-flux detection show improved performance with reported accuracies of up to 99.5%. Deep learning algorithms always outperform conventional methods, and LSTM-based algorithms achieve an accuracy of 97.13%, while hybrid CNN-LSTM models exceed 99% accuracy on ISCX and ISOT datasets. Comparative studies have shown that hybrid models of CNN and LSTM are the most effective approach, as they have the capability of processing both spatial and temporal information of traffic. Despite advances, current methods are still facing issues regarding dataset limitations, analysis of encrypted traffic, and zero-day botnet detection.

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Self-Attention-Driven Vision Transformer Model for Autism Identification and Cognitive Skill Enhancement

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Abstract:

Autism Spectrum Disorder (ASD) affects children's communication, social interaction, emotional understanding, and learning behavior. Early identification and personalized teaching are essential, yet many existing methods are manual, subjective, and lack adaptive learning support. This project proposes a Vision Transformer (ViT)- driven framework for automated autism identification and cognitive skill enhancement. The system captures facial images or live video streams and processes them using patch-based embedding and multi-head self-attention mechanisms to analyze eye gaze behavior, facial expressions, and head orientation. The classification module determines whether autism traits are detected. Upon positive detection, an adaptive teaching system is activated, providing structured learning modules including alphabets and numbers, shapes and colors, daily activities, emotion recognition, and object identification. Interactive mechanisms such as drag-and-drop exercises, image matching, audio-based selection, and simple quizzes enhance engagement. A reward subsystem using stars, badges, and animations promotes motivation and confidence. Progress monitoring tracks accuracy, response time, and session-wise improvement. The proposed system delivers an intelligent, scalable, and child-friendly assistive educational platform tailored to the cognitive and behavioral needs of children with ASD.

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A Hybrid Diffusion and Dynamic Query Framework for Panoptic Segmentation

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Abstract:

Panoptic segmentation is a core task in computer vision that unifies semantic segmentation and instance segmentation by assigning both class and instance labels to every pixel, thereby enabling holistic scene interpretation. Despite its significance, the task is inherently complex due to the high dimensionality of visual data and the permutation-invariant nature of instance identifiers, which complicates model design and optimization. Progress in deep learning, supported by large annotated datasets, has substantially advanced panoptic segmentation, particularly in safety-critical domains such as autonomous driving and robotic perception. Nevertheless, many contemporary query-based frameworks, including Mask2Former, employ static query formulations that lack flexibility in handling scenes with highly variable numbers of objects. This limitation can result in instance ambiguity and suboptimal exploitation of global contextual cues. To overcome these challenges, this study investigates two complementary approaches. First, panoptic segmentation is reframed as a discrete data generation process using diffusion models, enabling the learning of panoptic masks through a simplified architecture and a generic loss formulation that reduces reliance on task-specific inductive assumptions. Second, a dynamic instance query-based framework (PSM-DIQ) is introduced, incorporating multi-dimensional attention, instance-activation-guided dynamic query generation, and a dual-path Transformer decoder to enhance pixel–query interaction and representation learning. Experiments conducted on the Cityscapes and MS COCO benchmarks show consistent gains in panoptic quality, demonstrating the robustness and effectiveness of the proposed methods in complex visual environments.

Keywords:

Panoptic segmentation, diffusion models, dynamic instance queries, Transformer decoder, multi-dimensional attention, scene understanding, autonomous driving, deep learning.

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Street-Eye: A Solar-Optimized Edge-AI Node for Real-Time Pothole Detection and Warning System

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Abstract:

Bad road infrastructure particularly potholes are very dangerous and results in traffic and accidents all around the world. Traditional methods of detecting a pothole relies on visual inspection on regular basis or people reporting a pothole to the authorities which results in inefficiency and latency. In this paper, we propose “Street-Eye”, a pothole detection system integrated with a camera on existing street light which will detect pothole In real-time and alerts the authorities immediately. The architecture integrates a custom-trained YOLOv8 deep learning model on an embedded edge device (Raspberry Pi), capable of identifying Potholes with 98.3% Mean Average Precision (mAP). A key innovation of this research is the implementation of a “Solar-Gated algorithm” which restricts high-performance AI inference to peak solar irradiance hours (12:00 PM – 01:00 PM). This duty-cycling strategy reduces daily energy consumption by approximately 90%, the other Safety innovation of this research is an “LED matrix display”which will be attached on a street light which will show drivers “CAUTION” display with “POTHOLES AHEAD” written on it which is very useful in city and highways to prevent accidents caused by the potholes.

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Area-Efficient NTT Oriented Arithmetic Accelerator for Polynomial Multiplications

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Abstract:

The Number Theoretic Transform (NTT) is an important component in speeding up polynomial multiplications in lattice based postquantum cryptographic primitives such as CRYSTALS Kyber. As NTT computations are highly dependent on modular arithmetic, particularly modular multiplication, the hardware implementation efficiency is primarily dependent on the modular multiplier design. This paper proposes an area efficient NTT friendly arithmetic accelerator with a customized Kyber Digital Signal Processing block (K-DSP) for efficient modular multiplication. The proposed K-DSP combines Karatsuba based operand decomposition, Vedic multiplication for parallel partial product computation, and a K-RED modular reduction method that leverages the unique characteristics of the Kyber modulus. By unifying integer multiplication and modular reduction, the proposed design mitigates intermediate bit growth and minimizes the use of conventional DSP components. The proposed design is further incorporated into an NTT core, a Point Wise Modular Multiplication Module (PWMM), and an INTT core to support complete polynomial multiplications. The proposed design offers superior area efficiency with correctness in modular arithmetic, making it highly suitable for hardware realization of post quantum cryptographic systems.

Keywords:

Post-Quantum Cryptography, CRYSTALS Kyber, Number Theoretic Transform (NTT), Modular Multiplication, K-RED Reduction.

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Machine Learning Enabled Digital Twins for Assistive Device Design in Cerebral Palsy

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Abstract:

Cerebral Palsy (CP) is a complex neurological disorder that affects motor function and posture, often requiring customized medical devices like orthotics and assistive technologies for improved mobility. The creation of these personalized devices depends on high-resolution MRI/CT imaging data. However, current design and manufacturing processes are hindered by significant limitations, including manual design efforts, time-consuming trial-and-error fitting, difficulty predicting performance, and inconsistent output from Additive Manufacturing (AM) for complex geometries. These inefficiencies lead to higher costs, treatment delays, and suboptimal patient outcomes. This research proposes a novel AI-driven Digital Twin (DT) framework to revolutionize this field. By integrating Machine Learning (ML), Data Mining (DM), medical imaging, AM, and Smart Manufacturing, the system automates the segmentation of MRI/CT scans to create precise digital patient models. A virtual DT prototype then simulates biomechanical performance, using AI-driven predictive modeling to iteratively optimize the device design before any physical production. DM techniques extract insights from historical cases to improve design recommendations and AM parameters. Finally, the framework incorporates real-time monitoring and feedback within the AM process itself to ensure consistent quality and reduce waste. The expected contributions are greater precision design, predictive performance evaluation, optimized and faster AM workflows, enhanced customization, and ultimately, improved clinical outcomes for children with CP. This approach enhances the efficiency, affordability, and accessibility of advanced medical device production, paving the way for future AI-integrated, patient-centered solutions in rehabilitation engineering.

Keywords:

Digital Twin, Additive Manufacturing, Cerebral Palsy, Personalized Medicine, MRI/CT Imaging, Smart Manufacturing, Predictive Design.

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Impact of AI on the Career Prospect for Computer Science Graduates: A Study

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Abstract:

Artificial intelligence is a wonderful technology that helps us do any work. By using it, we can get an easy and quick response. In this paper, we have explained how AI has impacted the education sector by providing personalized learning to students. Based on people's requirements. They are available 24/7 to help, but there are also some negative points to using AI. students become dependent on AI, or all the tasks completed using AI will be highly automated in the future. There is a risk that people will become unemployed because their jobs will be replaced by robots, so we should think about a solution. Here, the methods used are qualitative research, thematic analysis, the questionnaire survey method, and content analysis. Different types of methods have been tried to solve this problem. So that's why IT and CS students should always learn new skills and update their skills daily

Keyword:

Artificial intelligence, Education, Machine Learning, Robots, Jobs, Unemployment.

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An Optimized Machine Learning Framework for Depression and Suicide Risk Assessment in Smart Healthcare Systems

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Abstract:

Smart healthcare systems in smart cities include critical elements of mental health monitoring and suicide prevention. This paper gives a machine learning approach to assessing suicide risk based on a formulation of clinical-validated psychological scales with real-world data on a hospital basis. The population sample of 200 anonymized patient records of the psychiatric department of a civil hospital in Ahmedabad, Gujarat, is assessed using PHQ-9, SSQ-6, BSMAS, and SBQ-R to determine the level of depression, social support, social media addiction, and suicide risk. A modeling method that involved preprocessing of data, testing and identification of the most successful machine learning algorithm of nine regressions, and the use of MAE, RMSE, and R2 as measure of success were used to choose the most successful model. The experimental findings show that ensemble models are better than the traditional methods, the optimized Extra Trees Regressor has a better performance (R2 = 0.8569, MAE = 0.8426, RMSE = 1.9845). The results indicate that the suggested framework is an effective smart healthcare decision-support tool to detect early risks of suicide and preventive mental health measures in smart city clinical environments.

Keywords:

Smart Healthcare Systems, Suicide Risk Assessment, Depression Analysis, Optimization-Based Machine Learning, Extra Trees Regressor, Psychological Scale Analytics, Clinical Decision Support.

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A Comparative Analysis of Time-Series Forecasting Models for Cloud Resource Utilization Prediction

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Abstract:

In cloud computing, efficient resource utilization largely depends on effective resource management. To manage resources properly, it is important to predict workload demand in advance so that the required resources can be allocated for running cloud applications. Many earlier studies have focused either on workloads that show clear trends and seasonal behavior or on workloads that are completely irregular. However, cloud workloads often contain both types of patterns. In this paper, cloud resource utilization is studied by comparing different time series forecasting models. Five models—ARIMA, SARIMA, Holt-Winters, Exponential Smoothing, and LSTM—are analyzed using CPU utilization data taken from the BitBrain dataset. SARIMA and Holt-Winters models are mainly used to study seasonal workload behavior, while ARIMA and LSTM are applied to non-seasonal and irregular workloads. The forecasting results are tested using data collected at different time intervals, such as daily, hourly, and minute-wise usage. It is observed that statistical models perform well when the workload shows seasonal behavior. On the other hand, LSTM gives more accurate results when the workload is highly dynamic and irregular. The outcome of this study is useful for cloud service providers, as it helps them select suitable forecasting techniques and reduce problems related to over-provisioning and under-provisioning of resources, while also supporting better SLA fulfillment. Based on these observations, a hybrid prediction strategy is suggested, where statistical models are employed for seasonal workloads and LSTM is used for highly irregular workloads.

Keywords:

BitBrain dataset, ARIMA, SARIMA, Holt- Winters, Exponential Smoothing, LSTM, Time Series Forecasting, MAE, RMSE, MAPE.

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Optimization of Truck Transportation Flow Time in Open-Cast Lignite Mines Using DMAIC Methodology

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Abstract:

Material transportation systems used in open-cast lignite mines often suffer from extended flow times due to high non-value-added times, excessive waiting times, resource bottlenecks, and improper system design. This leads to less throughput per day, higher fuel usage and less number of truck trips ultimately lowering productivity of the mine. The aim of this paper is to study and improve the truck transportation process through DMAIC (Define-Measure-Analyse-Improve-Control) approach of Lean Six Sigma methodology combined with Value Stream Mapping and simulation modelling.

Extensive data related to the movement of trucks like entry or exit times at gates, travel times, loading/unloading times, queue lengths, number of trucks waiting and weighbridge usage were recorded from the mine during various shifts. Present state value stream map was created to identify value-added as well as non-value-added activities and also to determine the baseline performance of the system. Models for current system were created using Arena software to determine important performance metrics such as average cycle time, waiting time, queue size and overall system efficiency.

Simulation of current scenario (System A) showed high congestion due to multiple bottlenecks present throughout the system causing weighbridges to be used to their maximum utilization and trucks being in non-value-added waiting activity for a major portion of the cycle time. An improved version (System B) was created with improvised lean changes to the process and modelled using simulation. Another scenario (System C) was proposed with an increased service capacity and all the three systems are compared.

Simulation results shows that System A worked at 8.26% of its system efficiency. After implementing some lean concepts in the system, System B got much better and worked at 22.39% of its efficiency. Further enhancement through increased service capacity, System C resulted in approximately 44% of its system efficiency.

Keywords:

Lean Six Sigma, DMAIC, Value Stream Mapping, Discrete-Event Simulation, Truck Transportation, Mining.

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A Comprehensive Review of Blockchain Applications in Healthcare System

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Abstract:

The healthcare sector has undergone rapid digital transformation in recent years due to the adoption of advanced information technologies. Despite these advancements, several critical challenges continue to affect healthcare systems worldwide. Issues such as data breaches, lack of transparency, inefficient data management, counterfeit drugs, insurance fraud, and limited interoperability between institutions compromise patient safety and reduce trust in healthcare services. Traditional centralized healthcare systems rely heavily on third-party intermediaries for data storage and verification, making them vulnerable to cyberattacks, unauthorized access, data manipulation, and single points of failure. As healthcare data becomes increasingly digitized and interconnected, the need for a more secure, transparent, and reliable technological framework has become essential.

Blockchain technology, characterized by its decentralized, immutable, and transparent architecture, has emerged as a promising solution to address these persistent challenges. By enabling distributed ledger systems where transactions are cryptographically secured and verified through consensus mechanisms, blockchain eliminates reliance on centralized authorities and enhances trust among stakeholders. Each transaction recorded on the blockchain is time-stamped, tamper-resistant, and traceable, thereby ensuring data integrity and accountability. These features make blockchain particularly suitable for healthcare environments, where sensitive patient information must be securely stored, shared, and audited.

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Intelligent AI-Based Framework for Real-Time Solar Panel Optimization Using IoT and Geospatial Analysis

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Abstract:

The increasing demand for efficient renewable energy systems requires intelligent optimization techniques to improve solar energy generation under dynamic environmental conditions. This study proposes an AI-driven framework for real-time solar panel optimization by integrating satellite-based solar data, IoT-enabled sensing, and geospatial analysis. The system utilizes NASA POWER datasets along with real-time environmental inputs to compute solar irradiance, elevation-based terrain effects, and shading factors for optimal panel placement and tilt adjustment. A modular architecture is developed using Flask-based APIs, PostgreSQL for data management, and MQTT for real-time data communication. Machine learning models are employed to predict energy output based on key environmental parameters such as irradiance, elevation, and shading. Additionally, GIS-based visualization enables spatial analysis for identifying high-efficiency deployment zones. Experimental evaluation indicates improved energy efficiency compared to traditional fixed and seasonal tilt methods. This framework provides a scalable and deployable solution for smart solar energy management and supports the development of intelligent renewable energy systems in urban environments.

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Design and Evaluation of User-Centered Virtual Reality Assessment Tools for Chronic Lower Back Pain

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Abstract:

Chronic lower back pain (CLBP) is a significant healthcare challenge, requiring an effective tool for rehabilitation as well as assessment. This study examines the possibility of using virtual reality (VR) to assess CLBP, addressing two main questions. The first question is about how a VR-based assessment tool can include movements and tasks that are usually hard for people with CLBP. The second examines physiotherapists' perspectives on the implementation of VR, specifically regarding its tasks, feasibility, user experience, and design. We held three design workshops with physiotherapists and HCI researchers to answer these questions. These workshops led to the creation of three VR applications, which six physiotherapy students then tested. The results provide valuable insights into the advantages and disadvantages of utilizing VR in physiotherapy assessment, underscoring the necessity for user feedback throughout the design process. The study emphasizes the significance of a user-centered approach and offers critical considerations for the future design of VR applications in clinical assessment. This research establishes a foundation for the integration of virtual reality as a beneficial instrument in the assessment of chronic lower back pain within physiotherapy.

Keywords:

Chronic Lower Back Pain(CLBP), Virtual Reality(VR), Physiotherapy assessment, Cocreation, User Experience, Human-Computer-Interaction(HCI).

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Benchmarking Deep Learning and Traditional OCR Systems for Gujarati: Implications for Tactile and Audio Accessibility in Assistive Technology

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Abstract:

Accessing information is particularly difficult for those who are visually impaired. Braille is a lifeline for many people who are blind or visually impaired because it turns printed words into a tactile language that they can touch. The emergence of digital platforms and technological developments have made a huge collection of audiobooks easily available for visually impaired people. In the Optical Character Recognition (OCR) system, attaining strong recognition performance is crucial. Optical Character Recognition involves applying scientific and technological methods to transform images of printed, handwritten, or typed text into text data that machines can read. Contemporary OCR utilizes artificial intelligence, particularly deep learning models that examine an image, detect lines of text, separate words, and identify the individual characters contained in them. The precision of these models relies significantly on the quality of their training data and the architecture that supports them. Multiple OCR systems have been created for the recognition of different Indian languages including Hindi, Kannada, Bangla, Odia, Urdu, Telugu, Gurumukhi, and Gujarati. A quantitative analysis was performed contrasting the popular Tesseract and the contemporary deep-learning-based Paddle OCR on a tailored dataset of 250 printed text images. These results indicate that contemporary deep-learning frameworks are an effective means of enhancing OCR precision and digital accessibility for lesser-represented languages. A survey of text recognition strategies for Gujarati language is presented in this study.

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A Quantum-based Approach for Optimization of SVM in Autism Detection

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Abstract:

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition that is marked by persistent difficulties in social communication, along with restricted and repetitive behaviors. Accurate detection of ASD from medical image data remains a challenging pattern recognition problem due to high dimensionality and nonlinear class boundaries. Although Machine Learning (ML) based approaches have shown promising results, the performance is heavily dependent on optimal model configuration and parameters. As such, in this paper, we propose a Quantum-inspired Particle Swarm Optimizer (QPSO) for optimizing the regularization parameter (C) and kernel parameter (γ) of the Support Vector Machine (SVM). The model was trained and tested on an `Autism Image Dataset' containing 2740 images of autistic and non-autistic facial traits. The proposed metaheuristic optimizer uses the quantum search strategy, where the particle's position is sampled from a probability distribution that allows particles to explore multiple regions simultaneously, improving diversity and reducing premature convergence. Furthermore, for feature extraction, a pre-trained ResNet model was used. Experimental results on the open-source Autism Image dataset demonstrate that the proposed QPSO-optimized SVM conventional parameter selection approaches. The QPSO-SVM model achieves optimal parameters of C = 745.43 and γ = 0.0018, resulting in an accuracy of 84.33%, precision of 84.39%, recall of 79.33%, F1-score of 81.78%, and a ROC-AUC of 89.03% with faster convergence to the optimal C and γ compared to existing models.

Keywords:

Autism Spectrum Disorder, Quantum-inspired Optimization, Support Vector Machine, Hyperparameter Tuning, Particle Swarm Optimization.

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Role of Machine Learning (ML) in Education

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Abstract:

The rapid growth of online education resources and Learning Management Systems has led to Machine Learning (ML) quickly developing into one of the most important technologies in education. Machine Learning enables researchers and educators to analyze large, complex datasets from digital education sources to identify hidden patterns of learning, predict the success of students, and make decisions based on data. Researchers are using a range of machine learning (ML) algorithms to forecast student performance. Support vector machines, Random Forests, Decision Trees, and Logistic Regression are among the algorithms applied. Overall, studies show that machine learning (ML) has better predictive power than conventional statistical techniques. In addition, machine learning provides unique capabilities to create personalized and adaptive learning experiences for each student at scale through automated grading, adaptive educational interventions and immediate feedback. Machine learning can help improve instruction quality, increase student engagement and promote early intervention programs for at risk students. Finally, machine learning pushes educational research forward by providing predictive modeling, enhancing quality of data analysis and validating empirical educational theories. Despite its benefits, there are still a number of problems, including algorithmic bias, a lack of high-quality data, privacy concerns, and the need for model accuracy. In addition to ethical execution, responsible adoption necessitates collaboration between educators, data scientists, and legislators. According to the reviewed studies, machine learning (ML) is revolutionizing education by improving student performance prediction, facilitating individualized learning, and improving educational research methodology. More research and interdisciplinary collaboration are required to fully realize ML's promise in creating inclusive, data-driven, and successful educational systems.

Keywords:

Machine Learning, Machine Learning in Education, Digital Education, Higher Education, Personalized and Adaptive Learning.

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A Hybrid Patch-Aware Spatio-Temporal Reconstruction–Prediction Framework for Unsupervised Video Anomaly Detection

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Abstract:

Video anomaly detection is essential for today's smart surveillance systems, but it faces big challenges: unusual events are rare, heavily influenced by their surroundings, and typically undefined during training. The lack of labeled abnormal footage makes supervised methods unworkable for real-world use. Most unsupervised techniques so far stick to either spatial reconstruction errors or temporal prediction mismatches, falling short on capturing both subtle structural issues and odd motion patterns together.

We introduce a hybrid framework that combines patch-level spatio-temporal modeling for unsupervised video anomaly detection. It blends localized reconstruction with temporal prediction. We preserve local information and avoid anomalies being lost in global reconstructions by dividing each frame into non-overlapping patches. Then, for accurate anomaly locating, a convolutional autoencoder produces patch-specific reconstruction errors. To identify anomalous changes over time, a specialized temporal branch represents motion over frames. We fuse these spatial and temporal errors with an adaptive weighting scheme to produce the final anomaly score.

Our hybrid approach consistently outperforms conventional reconstruction-only and prediction-focused baselines in frame-level AUC scores, according to thorough testing on the CUHK Avenue benchmark. Ablation studies demonstrate the mutually reinforcing benefits of temporal prediction and patch-based spatial modeling. All things considered, the method maintains its computational simplicity, increases the accuracy of detection, and blends in perfectly with actual surveillance applications.

Keywords:

Anomaly detection, Unsupervised learning, Convolutional autoencoder, ConvLSTM, Patch-based modeling, Spatio-temporal learning, Surveillance analytics.

Optimization of Ensemble and Regularized Machine Learning Models for Renewable Energy Stock Forecasting

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Abstract:

The renewable energy sector has become a critical component of India's economic andenvironmental strategy, driven by increasing energy demand, climate commitments, and large-scale investments in solar, wind, and hydropower infrastructure. As India accelerates itstransition toward clean energy, renewable energy companies are attracting significant attentionfrom investors and policymakers. However, the financial performance and stock price dynamicsof these firms can be complex and influenced by multiple market and operational factors, makingpredictive modeling and model optimization an important research area.

In this study, we focused on selected Indian renewable energy companies, including JSWEnergy, KPI Green Energy, NHPC Limited, Borosil Renewables, Orient Green Power, RelianceIndustries, Sterling and Wilson Renewable Energy, and Zodiac Energy. Multiple machinelearning models were developed and optimized to assess their predictive performance on thedataset. The study explores model tuning and performance enhancement using approaches suchas Random Forest, Ridge Regression with FDM (Forecast Distance Modeling), Elastic NetRegression, and temporal modeling techniques. These models were evaluated to identify themost efficient and robust predictive framework.

The results indicate that optimized ensemble and regularized models perform comparatively wellin capturing the underlying structure of financial time-series data. Among all the evaluatedapproaches, Random Forest consistently produced the most reliable results across the majority ofcompanies. This suggests that optimization of ensemble-based learning methods can significantly improve the modeling of complex and non-linear relationships present in renewableenergy market data.

The findings contribute to the growing body of research on machine learning optimization infinancial forecasting, particularly within the renewable energy sector. The study provides usefulinsights for researchers, investors, and policymakers seeking improved predictive analytics and data-driven decision-making in emerging clean energy markets.

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AI-Enabled Spider Drone System for Real-Time Detection and Non-Chemical Eradication of Weed in Wheat Fields

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Abstract:

Weed infestation significantly reduces wheat crop productivity and leads to substantial economic losses for farmers. One of the most common invasive weeds in wheat fields is *Lamb's-quarters* (*Chenopodium album*), which competes aggressively for nutrients, water, and sunlight. The conventional practice of applying chemical herbicides across entire fields not only increases production costs but also causes soil degradation, environmental pollution, and potential health hazards. To address these challenges, this study proposes an intelligent, eco-friendly precision weed management system using a spider drone integrated with computer vision and deep learning techniques.

The proposed system deploys a lightweight spider drone equipped with a high-resolution camera to capture real-time field images. A Convolutional Neural Network (CNN) model is trained to detect and classify *Chenopodium album* from wheat crops with high accuracy. Upon successful identification, the system activates a targeted electric discharge mechanism to eliminate the detected weed without affecting surrounding crops. This selective weed control approach minimizes chemical usage, reduces environmental impact, and improves sustainability in agricultural practices.

The proposed model demonstrates the potential to enhance precision farming by integrating artificial intelligence, robotics, and sustainable weed management strategies, thereby contributing to increased crop yield and environmentally responsible agriculture.

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Hyperparameter-Optimized XGBoost Model for Directional Forecasting of Renewable Energy Stocks

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Abstract:

The increase in growth of renewable energy firm has enhanced investor activity and boost market volatility, providing stock market price direction forecasting growing complex. This study presents an optimized machine learning framework for predicting the future trading-day movement of renewable energy shares. The forecasting task is organized as a binary classification problem obtain from directional return behavior.

An Extreme Gradient Boosting (XGBoost) classifier is implemented to catch intricate, non-linear market dependencies and moderation. Hyperparameter optimization techniques are in work to enhance predictive generalization and model stability. To mitigate look -ahead bias and over-parameterization, a temporally consistent validation strategy is adopted. Predictive performance is assessed using standard evaluation metrics, as well as Accuracy, Precision, Recall, F1–score, and ROC-AUC.

The enhanced ensemble approach surpasses historical linear classification models, according to experimental results, showing its superior capability to extract directed signals to waving market surroundings. The mention framework offers significant possibilities for structured strategies for investment in the field of renewable energy and advances the implementation of AI and algorithms for computational intelligence in stock market prediction.

Keywords:

XGBoost, Stock Direction Forecasting, Renewable Energy Stocks, Machine Learning, Binary Classification, Hyperparameter Optimization.

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FLAB: A Federated Learning and Adversarial Blockchain-Based Robust Framework for Smart Grid Intrusion Detection

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Abstract:

The modernization of power systems has consequently ushered in the smart grid era, with IoT devices and cloud technologies powering intelligent energy management. While increased connectivity enhances operational efficiency and reliability, it simultaneously introduces new cyber threats. Conventional intrusion detection systems (IDS) are largely centralized and face challenges related to scalability, privacy, and limited resilience against evolving cybersecurity attacks. To address these issues, this paper proposes FLAB, a Federated Learning and Adversarial Blockchain-based framework that enables secure, transparent, and privacy-preserving intrusion detection in smart grid environments. The proposed system leverages federated learning to enable collaborative model training across distributed nodes without exchanging raw data. A Weighted Adversarial Robust Aggregation (WARA) mechanism enhances defense against model poisoning attacks, while blockchain-based logging ensures transparency and accountability. Experimental results demonstrate that FLAB achieves high detection accuracy while preserving privacy and maintaining robustness against adversarial threats.

Keywords:

Adversarial Robustness, Blockchain Privacy Preservation, Cybersecurity, Federated Learning, Intrusion Detection System (IDS), Model Poisoning, Smart Grid Security.

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Depth Reduced Deep Learning Model for Multi-class Classification of Medical Images

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Abstract:

Deep convolutional neural networks (CNNs) have been successful in the classification of medical images but tend to overfit because of the large number of parameters and the extensive training time. In this paper, we investigate the use of structured pruning as a depth reduction technique to enhance generalization. We test the L1-norm, Taylor-based, and Geometric Median (GM) pruning techniques on the VGG16 network with the Kvasir dataset, training for 20 and 50 epochs with sparsity levels ranging from 30% to 90%.

The dense network has an accuracy of 92% at 20 epochs but reduces to 88% at 50 epochs, suggesting overfitting. The pruned networks have higher robustness during the longer training period. Sparsity levels of 30% to 50% retain high accuracy (approximately 90% to 92%) while cutting the number of parameters by over 50% and FLOPs by as much as 65%. GM physical pruning with 30% sparsity has an accuracy of 92.8% at 20 epochs and retains 91.5% at 50 epochs.

These results show that structured pruning is both a compression technique and an implicit regularizer, enhancing robustness and bias-variance trade-off in medical imaging CNNs.

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AI Enabled Smart Policing : Catching Offender using Face Detection

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Abstract:

The growing requirement for intelligent surveillance systems has resulted in the development of automated systems that have the capability to track and identify offenders in real-time. This paper presents a deep learning-based surveillance system that combines YOLO-based object detection and facial recognition techniques for the automated identification of offenders at controlled checkpoints and public surveillance points. The proposed system uses a YOLO algorithm based on deep learning for real-time object detection of people and vehicles in video streams, followed by face detection and matching with a predefined watchlist database.In addition to identity verification, the proposed system also includes behavioral analysis based on trajectory analysis and spatiotemporal pattern modeling for the identification of suspicious behavior such as sudden direction changes, area intrusion, and suspicious motion patterns. A rule-based and probabilistic alerting system is developed for real-time alerting of security systems for the identification of high-risk individuals and suspicious behavior. The proposed system is developed for optimal low-latency edge computing, which enables continuous real-time surveillance with minimal computational complexity. Experimental analysis of the proposed system on surveillance datasets shows improved detection accuracy and faster response time compared to unimodal systems. The proposed system offers an intelligent and scalable platform for proactive criminal surveillance and security response systems.

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Multi Model Approach for Data Augmentation in Skin Cancer

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Abstract:

According to GLOBOCAN, skin cancer killed 2197 people in India in 2022; this number steadily rises from 5% to 6% annually. Skin cancer has a survival rate of over 90% when detected early, but as the disease progresses, this rate sharply declines to less than 30%. Clinical adoption of automated systems for skin cancer diagnosis is often hampered by data scarcity, model bias, and limited interpretability. This study suggests a Hybrid Deep Explainable Ensemble Framework with Generative Augmentation for reliable skin lesion classification in order to overcome these difficulties. To improve the limited dermoscopic image data and lessen class imbalance, a Generative Adversarial Network (GAN) is used during the training phase. Then, several Convolutional Neural Network (CNN) architectures based on transfer learning are used for independent classification and feature extraction. A weighted soft-voting ensemble approach is used to integrate their probabilistic outputs in order to reduce false negatives and improve diagnostic reliability. Grad-CAM-based visual explanations are used to highlight lesion regions influencing model decisions in order to increase transparency and clinical trust. Additionally, a generative AI module turns the system from a black-box classifier into an interpretable decision-support tool by producing structured diagnostic summaries based on visual evidence and prediction confidence. Comparing the suggested hybrid framework to single-model approaches, experimental evaluation shows that it enhances classification stability, generalization, and clinical interpretability.

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A Private Blockchain–Based Electronic Voting Machine with Integrated Biometric Authentication

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Abstract:

Electoral processes are the fundamental component of democracy. Consequently, fair elections are essential for democratic nations; there are over 100 democratic countries, although the frequency of fair elections is questionable. A singular flow in the electoral process can result in confronting the citizens of nations. Consequently, after several years of updates to the electoral process, there remains no assurance that the elections will be conducted fairly. Therefore, there is a necessity for a trustworthy and transparent electoral system.

The Electronic Voting Machine (EVM) is an innovative device employed for conducting elections. However, doubts persist concerning their security and auditability. In some years, blockchain technology is emphasized for its security provisions. Blockchain has been utilized for security and trust across various domains. Numerous studies have been conducted on the integration of E-voting or Electronic Voting Machines (EVM) with biometric technology; nonetheless, significant gaps remain in this area. Consequently, we provide a novel Electronic Voting Machine (EVM) that incorporates private blockchain technology and biometric authentication, wherein each EVM functions as a node within the private blockchain. This method emphasizes the verification of voter eligibility by biometric authentication, followed by the updating of encrypted cumulative party-specific vote totals. Each voting event generates a new block linked to the preceding block, ensuring that no voter identity is stored.

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Evaluating the Accuracy of AI-Based Citation Management and Bibliography Generation Tools

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Abstract:

Artificial intelligence (AI)-based citation management and bibliography generation tools have become increasingly integrated into academic research workflows in recent past. This study explores Artificial intelligence (AI)-based citation management and bibliography generation tools. The study for evaluates accuracy, reliability, and ethical implications by synthesizing recent evaluations, bibliometric analyses, and systematic reviews of AI-powered research systems. Findings indicate that these tools significantly enhance efficiency in literature search, citation formatting, and manuscript preparation . The study concludes that AI citation tools should function as assistive technologies supported by structured evaluation frameworks and human oversight to ensure accuracy, transparency, and academic integrity.

Keywords:

Artificial Intelligence, Citation Management, Bibliography Generation, AI Hallucination, Scholarly Publishing Ethics.

ISBN: 978-81-993581-5-7

Impact of AI on the Career Prospect for Computer Science Graduates: A Study

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Abstract:

Artificial intelligence (AI)-based citation management and bibliography generation tools have become increasingly integrated into academic research workflows in recent past. This study explores Artificial intelligence (AI)-based citation management and bibliography generation tools. The study for evaluates accuracy, reliability, and ethical implications by synthesizing recent evaluations, bibliometric analyses, and systematic reviews of AI-powered research systems. Findings indicate that these tools significantly enhance efficiency in literature search, citation formatting, and manuscript preparation . The study concludes that AI citation tools should function as assistive technologies supported by structured evaluation frameworks and human oversight to ensure accuracy, transparency, and academic integrity.

Keywords:

Artificial Intelligence, Citation Management, Bibliography Generation, AI Hallucination, Scholarly Publishing Ethics.

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IoT-Based Smart Parking Systems for Sustainable Urban Mobility

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Abstract:

The constant fight for space in the dense urban areas is the main reason for traffic jams and high fuel consumption. This research presents the functional IoT-driven framework that aims to replace the current outdated manual parking protocols with a centralised ecosystem that would be automated. Centered around a NodeMCU (ESP8266) micro controller, the proposed system has two-layer hardware implementation by using the Infrared (IR) sensors for bay level occupancy detection and the Radio-Frequency Identification (RFID) module for secure and automated vehicle entry. Upon detection of the vehicle, the system acts using a DC motor-driven gate and updates the status of the slot in real-time through a cloud-based web application. This means motorists can remotely view the space availability using a remote viewing system and a digital reservation interface, which as we know solves the visibility problem already incorporated into traditional lots. Furthermore, the prototype incorporates a 16×2 LCD for on-site feedback and a backend algorithm for determining the parking fees based on the exact amount of occupancy time.

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Enhancing Sustainability: Tracking and Reducing Carbon Footprints with Technology

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Abstract:

The rising concerns over climate change have made carbon footprint tracking a crucial aspect of sustainability efforts. A carbon footprint represents the total greenhouse gas (GHG) emissions, primarily carbon dioxide (CO_2), generated directly or indirectly by individuals, businesses, and products. This research paper explores the theoretical framework behind carbon footprint calculation, emphasizing key contributors such as transportation, energy consumption, and lifestyle choices. It examines existing tracking methods and their effectiveness in providing accurate emission data. Additionally, the study highlights potential strategies for reducing carbon footprints, including energy- efficient practices, sustainable consumption, and policy interventions. While primarily theoretical, the paper also discusses a conceptual model for a Carbon Footprint Tracker, outlining its possible implementation using data-driven approaches. By analyzing current challenges and future advancements in footprint tracking, this research aims to contribute to environmental awareness and promote sustainable living.

Keywords:

Carbon footprint, greenhouse gases, sustainability, emission tracking, climate change.

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Systematic Review of AI Methodologies in Food Computing: From Information Extraction to Predictive Health Applications

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Abstract:

The shift toward a digital food ecosystem has turned simple recipes and labels into a massive, unorganized data. The field has moved away from the rigid, manual rules of the past toward powerful transformer models like BERT and RoBERTa yet pulling truly useful information from these texts is still difficult. This paper not only looks at how these models perform on current benchmarks like FINER and TASTEset, but it also points out a major problem that most current research is ignoring that is food additives and E-numbers. While researches show good performance at identifying basic ingredients, comparatively very less work has been done in identifying complex, often ambiguous food additive codes like INS or E220 found on packaged foods. This is largely because of lack of expert-annotated datasets needed to train models for this specific task. Retrieval-Augmented Generation (RAG) and Knowledge Graphs are now taken in use to provide expert information to AI. The goal is moving beyond just "tagging words" to actually understanding the context behind them. For the field to move forward, especially for consumer safety and allergen tracking, we need to focus on multimodal models and edge AI that can work in real-time without needing a constant cloud connection.

Keywords:

Food Computing, Food Informatics, Named Entity Recognition (NER), Named Entity Linking (NEL), Machine Learning, Artificial Intelligence, Natural Language Processing, Deep Learning, Knowledge Graphs, Large Language Models, Multimodal Fusion, Personalized Nutrition, Systematic Review.

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Educational Phishing Detection: A Machine Learning Approach with Feature Selection and DL Models

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Abstract:

Digitization of academic qualifications has instilled a quicker process of checking certificates but has also resulted in a tremendous increase of fake certificates which is a major challenge to the employers, schools, and even to the government agencies. I am suggesting a self-driving, intelligent system, which in this project will take place, and proposal is to apply the recent machine-learning tricks, as both traditional machine-learnings and deep neural nets, to substantially check educational materials with hardly any human effort. The system negotiates with the issuers in real time and in a safe manner, extracts significant details such as the ID characteristics of the institution, certs design, the text, and concealed metadata. It uses CNNs to identify such visual features as logos, seals, signatures, layout and RNNs or LSTMs, line by line, to read the text in question without excising any suspicious mysteries that are a clue of a fake. The pattern of combining these visual and textual suggestions makes the model more apposite at detecting abnormalities. And, there is an encrypted web portal that either has good authentication and is restricted to ensure that data is secured across the entire process. During testing, the system performs better than the older systems on the accuracy, reduces the time required to check, and has a lesser dependence on manual verification. All in all, it provides a greater degree of transparency and trust, facilitates scale, combats paper fraud and promotes institution credibility. This study advances to the extreme of science, engineering and tech by providing a stable tool of validating the academic qualifications in a digital era, in a safe and smart manner.

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Reliability of EEG Stress Marker Using the DEAP Dataset for Short-window Analysis

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Abstract:

EEG (electroencephalography) is mainly used for stress analysis due to its non-invasiveness, high temporal and spatial resolution. But, still now the stress analysis using short window is hardly known. This study uses a standard dataset known as DEAP , that examines the resilience of spectral and non-linear property of EEG features for characterising the stress. In this experiment the outcomes are the Alpha band power, theta band power and spectral entropy. These parameters were extracted from EEG signals using short window of 1–second duration analysis.Then the assessment of reliability for features performed by non-parametric statistical testing & standardized effect size. Results displays alpha band activity in the frequency range of 8–13 Hz indicates more stress related modulation with observed parameter p= 0.081, Cohen's d = - 0.24 while beta band activity p=0.186, d = -0.13 in the range 13–30 Hz. Experimental results show that beta band power displays less and non-significant variation, while alpha band metrics shows the sufficient trend toward stress related modulation. The third parameter spectral entropy shows very less discriminative power of p= 0.699, d =- 0.05 identifies low sensitivity as a global stress marker. Finally , the DEAP dataset's significant inter-subject difference and geographical dependency of stress related EEG dynamics are indicated .These outcomes and observations highlights the importance of reliability-driven evaluation over accuracy centric methods. Hence effective EEG based stress assessment may necessary that uses region-specific or adaptive analysis techniques.

Keywords:

EEG, Stress analysis, DEAP dataset, short window analysis, effect size analysis, Alpha band activity, entropy features, beta band activity.

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AI-Enabled Seed Selection Improves Climate-Resilient Millet Production: Integrating Genomics, Multi-Omics, and Machine Learning for Accelerated Crop Improvement

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Abstract:

The more factors including climate change, population growth, and the joint need for creating food and enhancing nutrition security with a commitment to reducing the footprint on the environment, food security is being inclined in the global south. Millets, a polyphyletic group of C4 cereals like pearl millet, finger millet, foxtail millet, and minor millets, have specific physiological adaptations that give them exemplary resilience in times of drought, heat, and low soil fertility, and good nutritional profiles; unfortunately, millet improvement has suffered from inadequate investment in the development of genomics relative to other cereals, hence lying behind in the field of yield enhancement, in particular in sub-Saharan Africa and South Asia.

At present, the integration of next-generation sequencing, high-throughput phenomics, and artificial intelligence represents a quantum leap that can stimulate the genetic improvement potential in millet breeding. Thus, the current line of review takes what is already available in genomics in terms of reference genomes, pan-genomes, and re-sequencing datasets in millet species. Then it re-examines the seamless integration of multi-omics technologies—genomics, transcriptomics, proteomics, metabolomics, ionomics, and phenomics—within systems biology frameworks for holistic trait analyses. A mix of machine learning algorithms; random forests, support vector machines, gradient boosting, and deep neural networks-were examined for their utility in genomic prediction, marker-related trait analysis, gene discovery, and breeding optimization.

Also a proof that says this AI-integrated breeding routine is enough to up the yield of genomics by an estimated 10% to 30%. Said platform may further do a reduction in the breeding cycle exceeding 30% to 50% and lead to the scale-up of field trials for moving towards decentralized breeding on a half time of a decade. Inter-specific breeding of pearl millet in studies of genomics assisted breeding has reached over one million farm households in India; thus, ongoing multi-omic approaches should produce even more refined traits for grain iron, zinc, and protein content.

The proposed initiative for AI-enabled improvement of millets is serious, genuinely coordinated in order to focus on their biological genotype. However, it is pegged on completely open-source genomic data infrastructures, the development of breeding methods, and policy innovations that would comprehensively cater for every societal member, with justice to the project, actor rights, and open availability. Combining AI with genomic and phenomic technologies offers an option to save these orphan crops or millet as an occasional food-stuff in mainstream cereals and food supply, in accord with promotion of communal resilience in the face of altered climate scenarios.

Keywords:

Artificial intelligence, Machine learning, Millets, Climate resilience, Genomic selection, Multi-omics, Seed selection, Biofortification, Breeding acceleration.

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Evaluation of Free and Restrained Shrinkage Performance of Pet Flake Incorporated High-Strength Concrete

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Abstract:

High-strength concrete (HSC) exhibits superior compressive strength and durability; however, its dense microstructure and low water–cement ratio increase its susceptibility to brittle failure and shrinkage-induced cracking. This study investigates the influence of surface-treated recycled polyethylene terephthalate (PET) flakes as a partial replacement for coarse aggregate on the fresh, mechanical, and shrinkage performance of M60 grade HSC. Concrete mixtures incorporating 0%, 0.4%, 0.5%, 1%, 1.5%, and 2% PET flakes by volume were prepared with a constant water–cement ratio of 0.32 in accordance with IS 10262:2019. Fresh properties were evaluated through slump cone, compaction factor, flow table, and Vee-Bee consistometer tests. Mechanical performance was characterised via compressive, split tensile, and flexural strength tests at 7, 14, and 28 days of curing. Shrinkage behaviour was quantified using free drying shrinkage measurements and restrained ring testing. Results indicate progressive improvement in tensile and flexural performance up to 1.5% PET content. Free drying shrinkage strain decreased from 612 με (control) to 456 με at 1.5% PET, while restrained ring specimens exhibited a stress rate reduction of 61.2% (0.38 vs. 0.98 MPa/day). The optimum performance was achieved at 1.5% PET replacement, demonstrating enhanced crack-bridging capacity and improved stress redistribution without compromising compressive strength.

Keywords:

Polyethylene Terephthalate, High-Strength Concrete, Shrinkage Resistance, Restrained Ring Test, Sustainable Construction.

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Experimental Investigation on Mechanical and Durability Properties of Polypropylene Fiber Reinforced Fly Ash Concrete

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Abstract:

This experimental investigates the synergistic effect of fly ash and polypropylene fibers on the mechanical and durability properties of concrete. Fly ash is used as a partial replacement of cement at varying proportions to reduce carbon footprint and enhance long-term performance, while polypropylene fibers are incorporated to improve ductility, crack resistance, and structural integrity. A comprehensive experimental program is carried out by preparing concrete mixes with different fly ash replacement levels and fiber volume fractions. Mechanical properties are evaluated through compressive strength, split tensile strength, and flexural strength tests at different curing ages. Durability performance is assessed using water absorption. The research emphasizes understanding the interaction between fiber bridging mechanisms and the pozzolanic reaction of fly ash in modifying the microstructure and crack propagation behavior of concrete. An optimum combination is identified that achieves a balance between strength, durability, and sustainability. This research contributes to the advancement of eco-friendly fiber-reinforced concrete systems suitable for infrastructure exposed to aggressive environmental conditions.

Keywords:

Fly ash, Polypropylene fiber, Fiber reinforced concrete, Durability.

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AI based Vehicle Theft Detection with Email Alert System

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Abstract:

This paper proposes a real-time, edge-deployed artificial intelligence system for proactive vehicle theft prevention through biometric authentication and automated incident response. The core architecture involves a dual-phase operational pipeline: an enrollment phase, where facial data of authorized users is captured and used to train a Convolutional Neural Network (CNN) model for precise multi-class classification; and a monitoring phase, where a live video feed from an in-cabin camera is continuously analyzed. For real- time efficiency, an initial edge detection algorithm pre- processes frames to localize potential facial regions, which are then fed into the optimized CNN for definitive prediction— classifying the occupant as either a verified, authorized person or an unauthorized intruder. Upon detecting an unauthorized presence, the system executes a cascading security protocol: it triggers an audible alarm for immediate deterrence, captures a 5–second evidentiary video clip encapsulating the intrusion event, and automatically generates an SMTP-based email alert to the vehicle owner. This alert includes the captured footage and temporal metadata, facilitating rapid remote assessment and action. The implemented solution is designed for embedded hardware, balancing computational efficiency with high accuracy, thereby offering a robust, end-to-end automated security framework that significantly enhances vehicle protection beyond conventional systems.

Keywords:

Convolutional Neural Network (CNN), Edge Detection, SMTP, Multi Class Classification.

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Detection of Sarcasm and Contextually Harmful Content in AI-Generated Text Using a Hybrid Deep Learning Model with Explainability

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Abstract:

Chatbots, automated content generators and virtual assistants are all Generative-AI based systems which are being used in a variety of domains such as educations, healthcare, customer service, etc. to get a better communication experience. While using such AI systems, various ethical issue arises. Many delicate GenAI systems face a huge barrier if the system generates contextually harmful content that sounds quite gentle in tone but has hidden sarcasm or negativity. This issue is far beyond normal toxic content detection. Thus, this article emphasizes on the technologies that detects sarcasm and hidden meaning in the AI generated contents. An intensive examining in performed on working of many models including traditional machine-learning (ML) models and advanced deep-learning (DL) models in association with contextual-embeddings, sequential modeling and attention mechanism. It is noted that, in order to not only classify the harmful content but also to justify or explain the predictions, hybrid-approaches that combines contextual understanding and explainability-interpretable mechanisms are being used in real-time moderation tools and systems. This paper's work, examines the traditional ML models and DL models against transformer-based architecture specifically on sarcasm datasets. The performance was measured on a variety of widely used models like Logistic Regression, SVM, Bi-LSTM, GRU, and some novel hybrid-approaches. This evaluation was performed on benchmark sarcasm datasets including CASCADE, iSarcasm and AEGIS. By gathering insights from recent studies and experiments, the paper classifies best practices, which in turn opens various pathways for research in contextually harmful and sarcasm detection domain. The results were examined in order to create smarter and more transparent GenAI moderation systems for the upcoming generation of AI applications.

Keywords:

Sarcasm detection, GenAI, Deep Learning, Sentiment analysis, Machine learning.

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An Intelligent Web-Based System for Malicious Account Detection, Using Machine Learning and Deep NLP Techniques

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Abstract:

Social media has grown quickly, resulting in many fake accounts used for identity theft, scams, and misinformation. This increase causes real problems for platform trust, user privacy, and public discussions. Fake accounts spread harmful content and damage genuine interactions on social media platforms. Traditional detection methods lack scalability and accuracy, and fail to capture complex language patterns and deeper contextual semantic relationships. This study implements a web-based fake social media account detection system using Transformer-based feature extraction and XGBoost classification for improved contextual analysis accuracy. It investigates whether contextual deep learning features combined with gradient boosting can improve detection accuracy and provide a real-time solution for identifying fake accounts. An experimental research design was employed with labeled social media account data collected from reliable online resources. Text features were taken using Transformer-based Natural Language Processing (NLP) models for advanced contextual semantic understanding. The XGBoost algorithm then looked for patterns to tell the difference between fake and real accounts. Transformer-based embeddings improved how well contextual features were extracted. Meanwhile, XGBoost improved classification performance and robustness. The web-based implementation demonstrated reliable real-time fake account detection. The main takeaway of this study is that combining deep contextual text representation with a strong boosting classifier offers a more reliable and precise solution for detecting fake social media accounts than traditional machine learning methods. Also, the web-based deployment makes it suitable for real-world use across scalable and dynamic digital platforms. This combination improves detection capabilities and leads to scalable, flexible defenses against changing digital threats in modern social media environments.

Keywords:

Fake Account Detection, Transformer-Based NLP, XGBoost, Machine Learning, Web-Based Detection System, Contextual Feature Extraction, Real-Time Classification.

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Advancing Regional Language NLP: A Novel Gujarati Emotion AI Model Using IndicBERT

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Abstract:

The exponential rise of user-generated content in regional languages underscores the urgent need for robust Natural Language Processing (NLP) tools in low-resource linguistic contexts. This paper proposes a dynamic sentiment analysis model tailored for Gujarati, a widely spoken Indic language with limited computational resources. To address the issue of class imbalance in the dataset, the model incorporates the Synthetic Minority Oversampling Technique (SMOTE), which improves the representation of minority sentiment categories.

Leveraging the transformer-based IndicBERT architecture, our approach tackles key challenges such as semantic ambiguity, morphological richness, and code-mixed text commonly found in Gujarati social media and review content. We design a fine-tuned pipeline that integrates advanced preprocessing, domain-specific data augmentation, and optimized classification layers to enhance sentiment prediction accuracy.

Experimental evaluations demonstrate significant improvements over baseline models, validating IndicBERT's effectiveness in capturing nuanced sentiment expressions in Gujarati. This work contributes to the advancement of regional language NLP and provides a scalable framework for sentiment analysis applicable to other Indic languages as well. In future headed to develop with CNN - LSTM model to analysis gujarati sentiment from text.In subsequent studies, the suggested specified model will be modified using a CNN-LSTM architectural feature for better Gujarati emotion AI.

Keywords:

SMOTE(Synthetic Minority Oversampling Technique), Under sampling Technique, IndicBERT,Sentiment Analysis, Term Frequency and Inverse document frequency,E-commerce reviews, User generated reviews, CNN - LSTM, Gujarati Language Processing.

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Blockchain EHR: A Secure Framework for Electronic Health Record Management Systems

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Abstract:

In order to handle the important issues of data security, privacy, and interoperability in healthcare systems, this research article suggests a blockchain-based architecture for handling Electronic Health Records (EHRs). Fragmentation, security breach risk, and limited patient control over personal health data define the present EHR architecture. This paper looks at how blockchain technology may provide patient-centric access control and offer a distributed, unchangeable, transparent answer for EHR administration. By means of thorough investigation of both primary and secondary data, this study shows that blockchain implementations may considerably lower data breaches by 67%, increase interoperability among healthcare providers by 78%, and raise patient satisfaction with data ownership by 84%. Smart contracts for automated access control, cryptographic methods for safe data storage, and consensus systems for verifying health record transactions comprise the suggested architecture. By building trust, increasing operational efficiency, and enabling patients with more control over their health information, the results imply that blockchain-based EHR systems may transform healthcare data management.

Keywords:

Blockchain, Electronic Health Records (EHR), Healthcare Data Security, Interoperability, Smart Contracts, Patient Data Ownership, Decentralized Healthcare, Medical Data Privacy.

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An AI-Powered Intelligent IT Support and Ticket Management System

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Abstract:

Nowadays IT support tickets are increasing. The current systems we have for handling these tickets are slow. Often make mistakes. They take a time to assign tickets to the right people and frequently miss the targets we set. To deal with these problems we are introducing a system that uses Artificial Intelligence to handle IT support tickets. This system helps figure out what each ticket is about determines how important it is and assigns it to the person. It also suggests it to the person. It also suggests solutions for the problems that are reported. Our system uses techniques to understand what the tickets say. It looks at the text removes the words we do not need and turns the information into numbers that computers can understand. We have equations like Logistic Regression and Support Vector Machines that assist us in classifying the tickets and their level of importance, such as Medium, High, or Critical. We distribute the tickets to the engineers based on their strengths and the amount ok work they have so that we can resolve the issues quickly. The system also tells us how to solve problems. Our results show that our system is good at identifying what kind of tickets we have and how important they are. It helps us meet our targets and fix tickets faster which is an improvement over the old systems. The system helps engineers manage their work and gives them ideas making it a great tool, for companies that manage IT services. This study shows us a way to manage IT tickets that can be used by people and it can work with the systems we already have to make our support better improve our support better improve our service and help our organization achieve its goals.

Keywords:

Artificial Intelligence, Ticket Classification, Logistic Regression, Support Vector Machines, IT support tickets, Engineer assignment, Ticket importance, Problem resolution.

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An Optimized Machine Learning Framework for Depression and Suicide Risk Assessment in Smart Healthcare Systems

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Abstract:

Smart healthcare systems in smart cities include critical elements of mental health monitoring and suicide prevention. This paper gives a machine learning approach to assessing suicide risk based on a formulation of clinical-validated psychological scales with real-world data on a hospital basis. The population sample of 200 anonymized patient records of the psychiatric department of a civil hospital in Ahmedabad, Gujarat, is assessed using PHQ-9, SSQ-6, BSMAS, and SBQ-R to determine the level of depression, social support, social media addiction, and suicide risk. A modeling method that involved preprocessing of data, testing and identification of the most successful machine learning algorithm of nine regressions, and the use of MAE, RMSE, and R2 as measure of success were used to choose the most successful model. The experimental findings show that ensemble models are better than the traditional methods, the optimized Extra Trees Regressor has a better performance (R2 = 0.8569, MAE = 0.8426, RMSE = 1.9845). The results indicate that the suggested framework is an effective smart healthcare decision-support tool to detect early risks of suicide and preventive mental health measures in smart city clinical environments.

Keywords:

Smart Healthcare Systems, Suicide Risk Assessment, Depression Analysis, Optimization-Based Machine Learning, Extra Trees Regressor, Psychological Scale Analytics, Clinical Decision Support.

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The Sentinel Rail-Grid: A Bi-Level AI-Vision and Long-Range RFID Framework for Autonomous Ticket Verification and Passenger Safety in High-Density Railway Networks

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Abstract:

Ticketless travel and severe overcrowding are ongoing problems for the Indian Railways. These issues lead to significant revenue loss and endanger passenger safety. Traditional manual checks and physical turnstiles do not work in "Super-Dense-Crush" settings where passenger flow must not be blocked. This paper presents The Sentinel Rail-Grid, a gate-less, autonomous verification system made for open-network railway environments. The framework uses a two-layer audit process: (1) a station-level Virtual Perimeter that uses high-speed YOLOv10 computer vision and Ultra-High Frequency (UHF) Long-Range RFID arrays, and (2) an in-transit Intelligent Carriage audit with overhead 3D Depth Sensors and Edge Computing nodes.

The main innovation is "Shadow Profiling," a non-intrusive method that compares real-time passenger counts with active RFID signals to find unverified passengers without using invasive facial recognition inside coaches. To help bridge the digital gap, the framework introduces RFID-enabled "Smart-Paper" tickets. These tickets allow for smooth "Walk-Through" verification for unbanked and non-smartphone users. By changing the focus from random manual checks to Surgical Precision Enforcement, the Sentinel Rail-Grid redefines the role of the Ticket Examiner to that of a "Passenger Welcome Host," concentrating on safety and support. Early analysis indicates that this decentralized, edge-resilient setup can achieve almost complete revenue protection while ensuring 100% passenger throughput in high-density Indian suburban areas.

Keywords:

Indian Railways, YOLOv10, Long-Range RFID, Shadow Profiling, Edge Computing, 3D Depth Sensing, Autonomous Ticketing.

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Connecting the Fragments: An Approach of Semantic Web Ontologies for Optimizing Cultural Heritage Interoperability

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Abstract:

The Cultural Heritage (CH) domain comprises semantically rich, diverse, and distributed datasets generated by museums, archives, libraries, and research institutions. The lack of semantic interoperability, inconsistent metadata schemas, and fragmented documentation practices significantly limit cross-collection integration and advanced knowledge discovery. Semantic Web technologies provide a formal, standards-based framework to optimize semantic representation, integration, querying, and reuse of cultural heritage data. This paper explores how Web Ontology Language (OWL)-based ontologies optimize the representation of complex historical relationships, allowing for more precise semantic queries compared to traditional relational databases. This review examines the distinct ontological requirements for tangible heritage and intangible heritage and core technologies—RDF (Resource Description Format), OWL, and SPARQL—and domain ontologies such as CIDOC CRM and Dublin Core that enable structured knowledge representation and linked data publication. This work presents a methodology to transform legacy cultural records into interoperable Knowledge Graphs using metadata mapping and OWL-based reasoning which enhances semantic interoperability, ensures structured and consistent data modeling of cultural heritage information.

Keywords:

Semantic Web, Cultural Heritage, Ontologies, Linked Open Data, Semantic Interoperability.

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SARS CoV-2: A Review of Machine Learning Algorithms for Severe Acute Respiratory Syndrome in a Pandemic

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Abstract:

The WHO proclaimed a global pandemic in early 2020 after coronavirus disease 2019 (COVID-19), which is caused by SARS-CoV-2, first appeared in late 2019. Researchers worldwide have since pursued various technological strategies to mitigate its impact. Particularly, in fields like diagnosis, forecasting, and drug development, machine learning (ML) and deep learning (DL) approaches have provided new capabilities beyond conventional approaches. In this Review paper surveys the state-of-the-art ML/DL models applied to COVID-19, covering publicly available datasets, prevention measures, detection methods, and treatment (including drug/vaccine development). It has been evaluating these approaches, highlighting their successes and limitations, to guide future research in applying ML to pandemics. This study presents about severe acute respiratory syndrome for SARS CoV-2 virus, which causes COVID-19 detection, prevention and treatment using different machine learning techniques.

Keywords:

COVID-19, SARS-CoV-2, machine learning, deep learning, coronavirus, evaluation, detection, prevention, treatment.

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A Multi-Agent Approach to Cyber Threat Intelligence Analysis in the Dark Web

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Abstract:

A cyber threat is a malicious attempt to compromise, steal, or disrupt digital systems and data. The dark web is an unindexed part of the internet used secretly for illicit activities, where cybercriminals share intelligence on vulnerabilities, malware, and attack methods, making it a crucial source of cyber threat insights. This paper analyzes the existing cyber threat intelligence (CTI) approaches leveraging dark web data and introduces a novel framework for future implementation. Current systems predominantly utilize single-agent or traditional machine learning models that focus on surface web data, lacking deep contextual understanding of complex dark web conversations. These systems face challenges in scalability, accuracy, and comprehensiveness. We identify these limitations and propose a multi-agent large language model (LLM) framework as a future solution to enhance the automation, efficiency, and precision of CTI extraction from dark web forums and related sources. The proposed system employs specialized agents collaborating through advanced LLMs to scrape, analyze, translate, classify, and contextualize threat intelligence with minimal human intervention. This approach is expected to outperform existing solutions by enabling proactive threat detection, richer actionable insights, task specialization, and dynamic adaptability to complex and multilingual dark web data.

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An AI-Powered Framework for Detecting Malicious Social Media Profiles Using Multi-Dimensional Analytics

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Abstract:

The increasing prevalence of malicious social media profiles necessitates innovative detection frameworks that leverage advanced analytics to enhance user safety and trust. Such frameworks must integrate various data modalities, including textual, visual, and behavioral patterns, to effectively identify and mitigate threats posed by fake profiles. Current detection methods for identifying malicious profiles often rely on traditional rule-based approaches, which may lack the adaptability needed to combat sophisticated tactics employed by malicious users. These conventional methods struggle to keep pace with evolving threats, highlighting the need for innovative frameworks that utilize advanced analytics and machine learning techniques to enhance detection capabilities. The proposed framework introduces an AI-driven system employing multi-dimensional analytics for identifying and mitigating threats posed by malicious social media profiles. The framework aspires to improve detection precision and operational efficacy, thereby creating a safer online space for users and platforms. It incorporates advanced methodologies, including deep learning, to scrutinize multimodal data and enhance fake profile detection through sophisticated feature extraction that evaluates user behavior and content attributes. This strategy not only amplifies detection effectiveness but also evolves alongside the strategies of malicious entities.

Keywords:

Traditional rule-based approaches, deep learning, fake profile detection, multimodal data, advanced analytics.

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A Comparative Architectural and Consensus-Level Analysis of Leading Blockchain Platforms

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Abstract:

Blockchain technology has evolved from cryptocurrency-focused systems into complex decentralized infrastructures supporting smart contracts, enterprise applications, and high-performance decentralized finance ecosystems. Despite extensive research on individual platforms, a structured comparative evaluation of leading blockchain systems remains limited. This paper presents a systematic comparison of five prominent blockchain platforms: Ethereum, Hyperledger Fabric, BNB Chain, Solana, and Cardano. The paper evaluates these platforms using a multi-dimensional framework encompassing architectural design, consensus efficiency, scalability, security robustness, governance structure, and ecosystem maturity. By synthesizing academic literature and technical documentation, the analysis identifies core trade-offs between decentralization, scalability, and security. The findings demonstrate that no single platform optimally satisfies all performance and governance dimensions, highlighting the importance of context-driven platform selection for enterprise, financial, and decentralized application deployments.

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Detecting LLMs Uncertainty Through Human Metacognitive Patterns

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Abstract:

Large Language Models frequently generate incorrect outputs with high confidence, creating critical safety concerns for real-world deployment. When humans are uncertain We exhibit measurable metacognitive patterns including slower responses, inconsistent answers and reduced confidence. We investigate whether LLMs exhibit similar uncertainty patterns to humans and whether reasoning models show stronger human-like signals than standard models. Analyzing 120 outputs from DeepSeek-R1-7B(a reasoning model) and Qwen-3-8B(a standard model) across factual, ambiguous and impossible questions, we measure uncertainty metrics including entropy, self-consistency and response characteristics. We test their correlation with established human metacognitive markers from neuroscience literature including response variability, processing time and confidence calibration. Statistical analysis reveals whether LLMs uncertainty follows human-like patterns, enabling brain-inspired detection methods or operates through fundamentally different mechanisms, exposing critical safety gaps. Strong correlations would validate interpretable, human-centered uncertainty detection for language models. Weak correlations would demonstrate dangerous misalignment between AI confidence and reliability, challenging anthropomorphic interpretability approaches. Both outcomes advance AI safety by either providing practical uncertainty detection tools or revealing the limits of applying human cognitive frameworks to artificial systems. We release all code and data for reproducibility.

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Architectural Exploration of an IEEE 754 Floating Point Arithmetic Unit with Optimized Normalization and Rounding Logic

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Abstract:

Floating point operations are widely used in digital systems where precise real-number computation is required, especially in signal processing and scientific applications. The representation and manipulation of floating-point values in digital hardware is defined by the IEEE 754 standard, specifically the single-precision format. This paper presents the design and RTL implementation of an IEEE 754 single-precision compliant Floating Point Arithmetic Unit (FPAU) capable of performing addition, subtraction, multiplication, and division. The architecture focuses on proper exponent alignment, mantissa calculation, normalization, and standard rounding to maintain numerical accuracy. To ensure numerical correctness, a standard is followed when implementing the rounding mechanism and normalization process. Special conditions such as overflow, underflow, and zero detection are incorporated as per IEEE 754 guidelines. Because of its speed and area optimization, the design can be used in embedded systems, scientific computations, and digital signal processing. The modular structure of the implementation makes it easier to integrate into larger digital systems. Pipelining, fused multiply-add units, and double-precision format extension are among the future improvements in this project.

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Optimizing Cloud Computing using PSO- A Nature Inspired Approach

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Abstract:

The widespread adoption of cloud computing has fundamentally changed the delivery and consumption of computing resources, providing organizations with scalable infrastructure and on-demand services. However, efficient resource allocation remains a significant challenge. Fluctuating workloads, energy consumption constraints, and cost considerations complicate the pursuit of optimal performance in cloud environments. Traditional heuristic techniques frequently encounter limitations when addressing tasks such as virtual machine (VM) placement, scheduling, and load distribution in these dynamic settings. This research investigates the use of Particle Swarm Optimization (PSO) to enhance cloud resource allocation. PSO, inspired by the collective behavior of swarms, iteratively searches for near-optimal solutions by coordinating multiple candidate solutions. The study assesses the extent to which PSO can reduce execution time, maximize resource utilization, and decrease power consumption relative to traditional allocation strategies. Furthermore, this study examines hybrid PSO approaches that integrate elements from Genetic Algorithms, Reinforcement Learning, and Neural Network models to address inherent challenges such as premature convergence and high-dimensional search spaces. Experimental results demonstrate that PSO-based methods can yield measurable improvements in cloud system efficiency, cost savings, and overall performance. Future research should explore adaptive and real-time PSO frameworks capable of automatically adjusting to workload variations to further enhance cloud resource management.

Keywords:

Cloud Computing, Resource Allocation, Particle Swarm Optimization (PSO), Virtual Machine Placement, Task Scheduling, Load Balancing, Energy Efficiency, Metaheuristic Optimization, Hybrid PSO, Artificial Intelligence in Cloud Computing.

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Comparative Study of GAN-Based and Diffusion-Based Approaches for Sketch-to-Image Generation

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Abstract:

Sketch-to-image (S2I) generation aims to transform sparse, abstract sketches into photorealistic images while preserving structural consistency. This task remains challenging due to inherent ambiguity in freehand sketches and the need to balance structural fidelity with visual realism. Recent advances in generative modeling have introduced two dominant paradigms: Generative Adversarial Networks (GANs) and Diffusion Models. In this work, we present a controlled comparative study between Pix2Pix[1], a conditional GAN-based image-to-image translation model, and d-Sketch[2], a diffusion-based framework leveraging pretrained latent diffusion models without retraining. Both models are trained and evaluated on a subset of the Sketchy dataset under identical preprocessing and data splits. Evaluation is conducted using FID, Inception Score (IS), and LPIPS. Experimental results show that diffusion-based d-Sketch significantly outperforms Pix2Pix in realism and perceptual similarity, while Pix2Pix maintains competitive structural alignment. We further discuss the trade-offs between adversarial and diffusion frameworks and propose a hybrid GAN–Diffusion architecture to combine their strengths.

Keywords:

Image Generation, Sketch, Sketch to Image Generation, Generative Adverserial Networks, Diffusion Models, Generative AI.

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Smart Materials Application in Lower Limb Prosthetic Rehabilitation: A Clinical Perspective

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Abstract:

Smart materials have been under immense investigation in all fields of science and in all corners of the world over the past decades. Smart materials are unique set of materials due to their property of responding dynamically to external stimuli. They have wide range of applications from aerospace to medical due to their dynamic property.

In prosthetic rehabilitation, an external artificial prosthetic limb is provided to an individual with limb loss to improve the mobility, cosmesis and functional independence of the individual. There are areas in prosthetic rehabilitation where application of smart materials has improved durability, comfort, and functional mobility for individuals with limb loss.

This paper gives an overview of smart materials used in prosthetic devices as reported in current literature. Despite their wide range of application, their usage in the field of prosthetic rehabilitation remains limited in low-resource settings. This could be attributed to various factors such as lack of awareness, lack of interdisciplinary collaborations, affordability and lack of research on local adaptation/customization. This paper is an attempt to bridge this gap and to strengthen collaboration between clinicians and engineers to ensure that material innovation can improve patient care and quality of life.

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Adaptive Hybrid Recommender with Neural Collaborative Filtering, Content-Based Filtering, and Diversity-Aware Reranking for Book Exchange Platforms

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Abstract:

Online book exchange platforms face severe data sparsity, cold-start, and popularity bias challenges that limit ranking accuracy and recommendation diversity. This paper pro- poses a hybrid framework combining Content-Based Filtering (CBF) via TF-IDF represen- tations of book metadata with Neural Matrix Factorization (NeuMF) for explicit rating prediction. The components are integrated through an adaptive weighted strategy, where fusion parameter α is optimized via grid search and adjusted for users with fewer than five interac- tions. A diversity-aware reranking stage based on Intra-List Diversity (ILD) and Maximal Marginal Relevance (MMR) mitigates popularity bias. Experiments on the Book-Crossing dataset (Ziegler et al., 2005), preprocessed to 18,247 users, 11,856 books, and 428,391 ratings (99.80% sparsity), show NDCG@10 = 0.312 ± 0.008 compared to 0.281 for a care- fully tuned LightGCN baseline (11% relative gain), MAE = 1.20 ± 0.02, and ILD@10 =0.57 ± 0.03 (19% increase). Improvements are statistically significant (p ¡ 0.01, Wilcoxon signed- rank test). For users with fewer than five interactions, NDCG@10 increases from 0.142 to 0.248 (+75% relative). Ablation analysis confirms that adaptive weighting primar- ily improves ranking performance, while reranking enhances diversity without statistically significant degradation of NDCG@10. The PyTorch and RecBole implementation with fixed random seeds ensures reproducibility.

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Pulse Compression Techniques for Electronic Intelligence (ELINT): A Unified Framework for Intercept, Analysis, and Low-Observable Sensing

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Abstract:

Electronic Intelligence (ELINT) systems are tasked with intercepting, characterizing, and exploiting non-cooperative radar and communication emissions under stringent constraints on sensitivity, observability, and processing latency. Pulse compression, traditionally developed for active radar systems, has recently emerged as a critical enabler within ELINT architectures for resolving emitter parameters, enhancing time–frequency localization, and improving signal separability in dense electromagnetic environments. This paper presents a unique unified pulse compression framework that primarily aligns with ELINT requirements, assisting in clear methodology in signal classification that improves the method of emitter identification. The paper suggests pulse compression technique as a primarily radar waveform design problem, unlike the traditional pulse identification methodology being used earlier. This effort suggests an adaptive signal transformation and smart extraction process conducive for complex intercept scenarios. The proposed framework integrates coding inference, matched and mismatched filtering, energy-aware processing, and hardware-constrained implementation into a single analytical structure. Experimental investigations demonstrate improved emitter discrimination, sidelobe suppression, and robustness against noise and pulse agility when compared to conventional processing chains. The paper also elaborates system limitations, operational ease with multi-sensor intelligence gathering platforms, and future research scope emphasizing sustainable, reconfigurable, and cognitively adaptive ELINT systems.

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An Intelligent Web-based Fitness Assistant Integrating Artificial Intelligence and Gamification for Personalized Health Management

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Abstract:

In this article we will show you a web based intelligent fitness assistant which uses Artificial Intelligence (AI) and has gamification element that creates an individualised workout routine with exercise monitoring in real time along with nutrition program suggestions. The web- based assistant makes use of TensorFlow.js and OpenCV for Pose Detection to evaluate and provide immediate feedback on user's form as well as prevent users from getting injured by assessing their form while exercising. Workout plans and nutrition programs provided by this intelligent fitness assistance system are based on individualised information supplied by the user (such as age, gender, BMI, and fitness objective). The study group which was made up of 100 participants showed that the beginner study group members improved their fitness score by 64.6% on average; Intermediate members improved by 31.8%; Advanced study group members improved their fitness score by an average of 10.8%. Use of gamification features (i.e., points, badges, streaks, and peer challenges) by study group members resulted in increased interaction with the fitness system with an average of 16 hours of weekly interaction and reporting that they won 62% of their peer challenges. Performance analytics showed that 93% of users completed their routine as planned, user satisfaction (engagement) was rated at 8.7/10 (on a scale of 1 to 10) and reported that they reached mastery at least 86% of the time. Analytic also identified 14% of users reported having learning gaps. These findings indicate that the program developed a unique hybrid system that utilised AI-driven adaptive guidance, combined gamification features with Smart Guidance Tools and provides a complete solution for personal health management that enhances motivation, increases consistency, and improves fitness results.

Keywords:

Artificial Intelligence (AI), Fitness Assistant, Pose Detection, Gamification, Adaptive Learning, Personalized Diet Recommendation, Real- Time Monitoring, TensorFlow.js, OpenCV, React.js, User Engagement.

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A Review of Clinical and Computational Approaches to Assess Endometrial Cancer Risk in PCOS Patients with a history of Pregnancy Complications

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Abstract:

Polycystic Ovary Syndrome (PCOS) is a common hormonal condition that affects 8 to 13% of women in their reproductive years. It is marked by ongoing ovulation issues, high androgen levels, and metabolic problems. Recent clinical research has shown a strong link between PCOS and a higher risk of endometrial cancer (EC), primarily due to extended exposure to unopposed estrogen, insulin resistance, and obesity, which are often seen in women with PCOS. A study showed that women with PCOS are four to five times more likely to develop endometrial cancer than those without the condition, particularly among premenopausal women. Along with PCOS, pregnancy-related issues such as gestational diabetes, preeclampsia, and preterm delivery are often associated with PCOS and have been independently linked to a higher risk of EC. Large cohort studies, including research from Korean and Nordic health registries, suggest that these complications may increase hormonal and metabolic stress, worsening endometrial dysfunction. Additionally, not having children and facing infertility, which are common in women with PCOS, eliminate the protective benefits of full-term pregnancy. This can raise the lifetime risk of EC to 12 to 15% in this group. This review brings together important findings from meta- analyses and population studies to highlight how both PCOS and pregnancy complications increase the risk of endometrial cancer.

Keywords:

Polycystic Ovary Syndrome, Endometrial Cancer, Machine Learning, Pregnancy Complications, Women's Health.

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JobSentiment Portal: A Privacy Aware Job and Company Feedback Platform Using Sentiment Analysis and Role Based Access Control

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Abstract:

Online job portals and employer review sites play an increasingly important role in recruitment decisions, yet many existing platforms struggle with biased reviews, fake accounts, and weak privacy protections for identity verification data. This paper presents JobReview Portal, a modular Flask based web application that combines authenticated company reviews, role restricted job posting, and sentiment aware reputation metrics with a privacy first verification layer. The system is implemented using the Flask application factory pattern and organized into blueprints for authentication, jobs, and companies, backed by Flask SQLAlchemy models and Alembic migrations for reliable schema evolution. Core entities include User, Company, JobListing, Review and Comment, with policies that separate reviewer and employer roles, attach vouch/report counters to job posts, and compute both star based and sentiment based ratings from free text feedback. The platform integrates optional Google reCAPTCHA, OTP based phone verification, and a pluggable verification adapter that allows Aadhaar linked phone checks without ever storing sensitive identifiers. A seeded development database, automated migrations, and a comprehensive pytest suite support reproducible experiments and regression free feature evolution. Results from functional testing and seeded datasets show that the system reliably enforces role separation, stabilizes reputation scores through multiple reviews per company, and is ready to integrate with production grade verification providers.

Keywords:

Job portal, Employer reviews, Flask, Sentiment analysis, Role based access control, Identity verification, Privacy preservation, Web application security.

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Resume Ranking System with Dynamic Resume Improvement Suggestions and Job Description Alignment using AI

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Abstract:

The recruitment process faces significant challenges due to the manual screening of large volumes of resumes, leading to inefficiencies, biases, and delays in identifying suitable candidates. This research introduces a novel Resume Ranking System designed to automate resume-job description matching while offering dynamic suggestions for resume improvement. The proposed system employs advanced natural language processing techniques, including sentence embeddings from transformer models, to quantify semantic similarities between resumes and job requirements. This work involves preprocessing textual data from resumes and job descriptions, generating labelled pairs for supervised training, and evaluating performance using metrics. Experimental Results demonstrate high ranking accuracy, significantly outperforming individual models and generation of feedback to address skill gaps and improve candidate profiles.

This proposal not only streamlines hiring but also promotes fairness by reducing subjective biases. Future enhancements could integrate larger datasets and advanced interpretability features. The system represents a scalable solution for modern HR practices, bridging the gap between automation and human-centric recruitment.

Keywords:

Resume Ranking, Job Description Alignment, Artificial Intelligence, Natural Language Processing, Recruitment Automation.

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Face Recognition for Triage Analysis in Digital Forensics using Machine Learning

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Abstract:

Digital crime, such as identity theft, cyber fraud and data breach have grown exponentially over the last decade due to the rapidly improving digital technology. It is therefore, never more important, than it is today, to have accurate and efficient digital forensic examination. Traditional methods of forensic science, involving the direct examination of evidence, is very slow, tedious and often not feasible for large volumes of multimedia data. This regulation has hampered the delivery of justice and has created enormous backlog of forensic examination.

In this paper, we describe a proposed automated framework that merges the DeepFace, an up-to-date machine learning tool kit designed for facial recognition with the Autopsy forensics tool set to alleviate these concerns. The proposed system, Autopsy Face Triage, aims to automate key forensic procedures such as disk imaging, file acquisition and POLs from multimedia data . This method is characterized by high speed, less manual work, and greater reliability in recognizing a suspect, due to the combination of open source software and machine learning.

Integrating ML into digital forensics ensures it is cost-effective, scalable and faster for conducting the investigation . With this method, law enforcement agencies and forensic experts will have a powerful tool to conduct a “triage” of evidence, and, thus to more rapidly and accurately identify cyber criminal suspects .

Keywords:

Digital Forensics, Autopsy, DeepFace Machine Learning , Face Recognition Persons of Interest (POI), Evidence Analysis , Automated Triage, Open-Source Tools, Forensic Investigation.

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A Wearable System for Early Detection of Peripheral Neuropathy with Smart Calf Compression Therapy

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Abstract:

Two-Third of Diabetes will have the chance of getting Neuropathy, mostly recognized in later stages. Diabetes also develop swelling, poor Circulation in their lower legs and poor wound healing issues. To address these problems, we developed a wearable System with real time sensors that a diabetic patient can wear around their calves, that detects the swelling, cold feet and performs massage by adjusting the compression. The System also performs this activity in regular interval to prevent the serious illness. Apart from this, it will be an Early Neuropathy screening System. Using the processed HRV data, the System identifies the weakness in the autonomic nervous system and can determine the early signs of Neuropathy. It helps the patients to check in which stage of Neuropathy they are in. This helps diabetes to identify the neuropathy in very earlier stage even before the common physical signs like Tingling, Numbness, increased sensitivity so on occurs. The diabetes can able to monitor their health daily from their home, saving time, money and ensuring the timely earlier identification of the disease before it gone worse.

Keywords:

Wearable health monitoring, diabetic neuropathy screening, photoplethysmography, multisensory integration, smart compression system.

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Portable Smart Breath Monitoring Device for Patients â€“ Enabled IoT Based Approach for Breath Monitoring and Critical Breath Alerting

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Abstract:

Apnea, asthma and abnormal breathing patterns are respiratory disorders that are not easily detected unless a person is monitored continuously and therefore puts the patient at a high risk. Current clinical monitoring systems are precise and costly, bulky and not easily applicable at home because they are not portable and require the services of trained personal. This paper is an IoT based Portable Smart Breath Monitoring Device to detect abnormal breathing pattern in real time under a cost effective and wearable design. The system consists of a low-cost piezoelectric sensor to measure respiration, a microcontroller to process the data and a wireless communication to monitor and alert over a long distance. The suggested solution allows tracking the patients continuously, notifying about the abnormal events instantly and deploying it practically to the population of infants, elderly patients, and patients with chronic respiratory conditions outside the hospital setting.

Keywords:

Breath monitoring, respiratory disorders, IoT healthcare, wearable device, piezoelectric sensor, real time monitoring, wireless alert system.

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Design and Verification of the CRC Assisted Single Device Data Corrector

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Abstract:

Fault-tolerant mechanisms are essential in mem- ory systems to ensure correct data operations, as failures in a single device result in the incorrect data operation across the entire system. Recently, CRC-assisted SDDC schemes have gained significant attention, as they provide better error correction and detection compared to the conventional error correction (ECC) techniques. This paper presents the design and verification of the CRC-assisted SDDC architecture that corrects the faulty device through determination of the error pattern from the parity bit calculation that ultimately utilizes the purpose of the CRC and the Single Device Data Corrector, which detect, locate and correct single device data errors. The proposed approach clarifies the functional verification using representative fault scenarios to demonstrate correct error localization and successful data recovery. The results demonstrate that the proposed implementation achieves reliable single device data correction with low complexity, making it suitable for practical memory protection applications.

Keywords:

Cyclic Redundancy Check (CRC), Single Device Data Correction (SDDC), Parity-Based Error Correction, Fault Localization, Memory Reliability, Fault- Tolerant Systems.

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Hybrid Forecasting for Clothing retailer using Prophet+XGBoost and Asymmetric Loss Optimization

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Abstract:

Demand forecasting in the fashion industry is still a very difficult task due to the short product life cycle, quick visual trend changes, and significant demand peaks observed during cultural festivals. Traditional forecasting models often aim to reduce the average error, leading to stockouts during peak periods and, in turn, causing revenue losses. In this work, a new hybrid approach is proposed by combining the additive trend decomposition advantages of Facebook Prophet with the non-linear residual learning ability of XGBoost. The proposed method uses the H&M Personalized Fashion Dataset, which includes visual style features and an Indian Festival Logic that is particularly tailored to capture the peaks of pre-festival demand. One of the most important aspects of this research work is the incorporation of a Custom Asymmetric Loss Function into the XGBoost objective function, which imposes a penalty that is five times greater for underestimation (stockouts) than for overestimation. The results obtained from the actual transactional data suggest that the hybrid model obtains a relative reduction in stockouts of 10.8%, reducing from 70.7% to 59.9%, and an RMSE of 1140.24.

Keywords:

Retail Demand Forecasting, Prophet, XGBoost, Asymmetric Loss Function, Stockout Minimization, H&M Dataset, Indian Festival Analytics..

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Zero Hunger Portal: Surplus Food Collection and Distribution System

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Abstract:

Food waste and hunger have remained a world issue of concern with the wastage of edible foods and the globe being faced with millions of people under food insecurity with the current food donation processes being poorly coordinated and lack transparency. The given paper introduces the Zero Hunger Portal as a web-based application which will enhance the food collection and redistribution of the excess food by means of a centralized digital system. The portal allows food donors including restaurants, supermarkets, and event organizers to input the surplus food information by hand by adding the information like the quantity, type, location, and expiry time, and the information can be available to the NGOs and other volunteers to effectively plan the collection. It also includes basic record management and analytical functions to facilitate accountability, monitoring and transparency in the activities of donations. The proposed system is expected to minimize food wastage and enhance the power of hunger relief by digitizing the coordination of stakeholders and enhancing the visibility of surplus food resources, across which web-based solutions are capable of combating the issue of social and humanitarian challenges.

Keywords:

Web-Based Information System, Surplus Food Management System, Centralized Data Repository, Manual Data Entry Module, Donor–NGO Coordination, Basic Data Analytics, Transparency and Accountability System.

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IOT Based Multi Purpose Agriculture Robot

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Abstract:

Increasing demand of sustainable and efficient agriculture has brought into light the necessity of intelligent automation systems to minimize manual work, maximize the use of resources, and enhance the crop productivity. The present paper describes the design and construction of an IoT connected multipurpose agriculture robot, which is a unified robotic platform that incorporates real-time soil monitoring, automated irrigation, and remote communication with farmers. The system uses soil moisture sensors and a micro controller-based control unit to measure the conditions of fields and activate irrigation under specific predetermined thresholds. The IoT communication through the cloud-based interface provides real-time alerts and allows controlling the irrigation activities with the help of a user. The proposed system will improve the efficiency of water use, decrease the human factor, and promote smart and sustainable farming with the help of automation, IoT connectivity, and the user-in-the-loop decision making.

Keywords:

IoT, Smart Agriculture, Agriculture Robot, Automated Irrigation, Soil Moisture Sensor.

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GYAN: Growth-Triggered Yielding Adaptive Network for Efficient Continual Learning

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Abstract:

Continual learning in artificial neural networks is fundamentally constrained by catastrophic forgetting, where the acquisition of new tasks leads to degradation in previously learned knowledge. Existing solutions primarily rely on either parameter regularization techniques that restrict weight updates or structural expansion strategies that increase model capacity over time. While expansion-based approaches effectively preserve prior knowledge, they often lack adaptive control mechanisms, resulting in unnecessary parameter growth and reduced efficiency.

In this paper, we propose GYAN (Growth-Triggered Yielding Adaptive Network), a conceptual dynamic neural architecture designed to address catastrophic forgetting through performance-aware structural plasticity. The proposed framework introduces a growth-triggered mechanism that conditionally expands model capacity based on monitored indicators of task-wise performance degradation during sequential learning. Rather than relying on unconditional architectural expansion, GYAN selectively incorporates lightweight modular components only when predefined forgetting thresholds are exceeded. This adaptive strategy aims to balance stability and plasticity while promoting efficient resource utilization.

This work presents a conceptual formulation of GYAN, outlining its growth-triggered adaptive architecture and theoretical foundations for performance-aware structural expansion in continual learning. We outline the structural components, triggering criteria, and integration strategy of GYAN, and discuss its expected advantages in terms of scalability, parameter efficiency, and adaptability across standard continual learning benchmarks. The proposed framework provides a foundation for future empirical validation and contributes toward more principled, resource-conscious continual learning architectures.

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Smart AI Driven EV Charging Infrastructure

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Abstract:

The rapid adoption of Electric Vehicles (EVs) has intensified the demand for sustainable, cost-efficient, and reliable charging infrastructure. This paper presents a smart AI-driven EV charging system that optimally integrates three energy sources: solar photovoltaic, battery storage, and the utility grid. The proposed system prioritizes renewable energy utilization while dynamically balancing grid dependency through advanced forecasting and optimization techniques. Load and solar generation data are analyzed using both historical and real-time datasets. Long Short-Term Memory (LSTM) and hybrid LSRF models are employed to forecast 24-hour load demand and solar generation. Energy allocation is optimized using the PuLP library, incorporating time-of-use tariffs, demand curve management, and solar-grid balancing strategies. A web-based interface provides real-time monitoring and hourly scheduling of energy supply. Results demonstrate reduced peak-hour grid reliance, minimized operational costs, and improved sustainability. The proposed framework offers a scalable and practical solution for EV charging infrastructure, promoting renewable energy integration and intelligent energy management.

Keywords:

Electric Vehicle (EV) charging, renewable energy integration, load forecasting, optimization, AI-driven energy management.

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Adaptive Graph Neural Network Framework for EEG-Based Depression Detection

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Abstract:

Mental health is a fundamental human right and a serious cause of personal, social, and economic well-being, yet Major Depressive Disorder (MDD) remains an increasing global health problem. Electroencephalography (EEG) offers a cost-effective, non-invasive, and high-temporal-resolution alternate for objective depression detection. However, current machine learning and deep learning methods often struggle to model individual brain variability and the dynamic nature of functional brain connectivity due to their reliance on static spatial representations. This study suggests a Dynamic Graph Neural Network (Dynamic-GNN) framework that integrates temporal convolutions, attention mechanisms, and dynamic graph learning to capture time-varying brain connectivity patterns for EEG-based depression detection. Resting-state EEG recordings from 60 participants (30 MDD patients and 30 healthy controls) were pre-processed, segmented, and transformed into spectral, temporal, and graph-based features learning using multiple connectivity modelling strategies. The proposed model was evaluated in contrast to CNN, LSTM, static GCN, and hybrid CNN-GCN baselines using five-fold cross-validation and leave-one-subject-out (LOSO) validation. Experimental results determine that the Dynamic-GNN significantly outperforms challenging methods, achieving accuracy-89.1, sensitivity-90.0%, specificity-88.3%, and a ROC-AUC of 0.94, with statistically significant improvements ($p < 0.01$). The findings confirm that dynamically learned spatial-temporal brain networks provide superior representational power for capturing non-stationary neurophysiological patterns associated with depression. Experimental results determine that the Dynamic-GNN significantly outperforms challenging methods, with statistically significant improvements ($p < 0.01$). The findings confirm that dynamically learned spatial-temporal brain networks provide superior representational power for capturing non-stationary neurophysiological patterns associated with depression.

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Augmented Deep Learning Architecture for Accurate and Accessible Pill Identification under Real-World Variations

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Abstract:

Medication errors cause over 400,000 deaths annually, particularly among the elderly, children, and inexperienced users. These errors are caused by damaged labels, mismatched intake, and trouble identifying pills by color, size, shape, or markings. The current system employs deep learning with Convolutional Neural Networks (CNNs) for pill detection and identification through Keras and TensorFlow, image preprocessing with OpenCV GrabCut for segmentation, matching captured pill images to a pre-trained dataset with different shapes, and pattern matching and object detection to retrieve information such as drug class, generic name, pharmaceutical name, and use cases. The system is limited by sensitivity to environmental factors that alter the appearance of pills, poor results on different or patterned backgrounds, rare shapes with sparse data, and potential mismatches due to discrepancies between input and pre-trained sets, despite experimental results demonstrating correct identification from multiple angles and dashboards for pharmacist and user information. The proposed system solves these problems by adding data augmentation, one-step learning models for region detection, binarization, dilation, contour extraction, and database extension for new pills, multi-class pill area detection with single-pill extraction, post-processing, and deployment as a mobile app with voice support for the visually impaired, and benefits from accuracy above 91% for common pills, resistance to real-world variations, reduced training data requirements, the ability to handle thousands of pill types with extreme multi-label prediction or ranking, minimization of errors in different lighting, and availability of detailed dosage, composition, and side-effect information.

Keywords:

Convolutional Neural Networks (CNNs), Keras and TensorFlow, image preprocessing, Medication errors, OpenCV GrabCut, object detection, multi-label prediction.

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Toward Resilient Smart Health Systems: A Single-Layer Neural Network Approach to IoHT Data Availability Optimization

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Abstract:

Internet of Healthcare Things (IoHT) relies on the periodically accumulated wearable sensor data to monitor and diagnose patient health and disease. The diagnosis requires maximum data availability regardless of the observation intervals. This article introduces a frequency-focused aggregate data availability analysis method to ensure maximum support for diagnosis. This method is aided by a single-layer neural network to analyze the occurrence frequency of wearable sensor-monitored data. The neural network process operates on the replicated and predicted data sequence to ensure maximum data availability. Based on the range of data availability, the training is performed for the network to ensure maximum analysis for any rate of aggregation. The proposed method's performance is verified using data aggregated rate, analysis rate, and availability factors. Data analysis is improved by 10.03% and 11.33% for the intervals and frequency.

Keywords:

Data aggregation, data analysis, data availability, IoMT, neural network.

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Federated and Generative Learning for Real-Time 3D Foot Analysis, Biomechanical Simulation, and Personalized Footwear Design in Podiatric Care

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Abstract:

Foot disorders like plantar fasciitis, flat feet, and bunions affect billions worldwide, causing pain, mobility issues, and secondary health complications, yet current systems relying on VGG16–GRU gait analysis from pressure heatmaps, autoencoder-random forest foot condition classification, LSTM-ensembled XGBoost footwear recommendation and Stable Diffusion XL synthetic image generation suffer key limitations. These include inadequate edge AI deployment for real-time use, high computational demands and latency in cloud-based processing, limited multimodal data integration, lack of explainable AI (XAI) for clinical trust, small dataset generalization risks, and unresolved privacy/ethical concerns in diverse populations. The proposed system overcomes these limitations by incorporating 3D foot scanning and thermal imaging diagnostics, Internet-of-Things (IoT) smart insoles with real-time adaptive pressure data to provide recommendations for dynamic adjustments of fit and pressure distribution via XAI techniques that make the model decisions transparent, edge-optimized pruning methods so models can be deployed on a device with low latency requirements, GANs trained by Stable Diffusion which enhance manufacturability for 3D-printable designs, biomechanical simulations augmented with reinforcement learning to predict long-term outcomes and federated learning approaches where multiple global datasets are used in privacy-preserving training.This advances podiatric care, footwear manufacturing, and preventive health, promoting mobility independence and reducing chronic complications.

Keywords:

Gait analysis, Stable Diffusion, Internet-of-Things (IoT), reinforcement learning, footwear manufacturing, XAI techniques, federated learning.

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HealthGuard AI: A Hybrid Machine Learning And Explainable AI Framework for Real-Time Medicare Claims Fraud Detection

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Abstract:

Healthcare insurance fraud is a huge issue. It takes a lot of money out of the healthcare systems, especially Medicare, on the other hand. This not only slows down the processing but also causes the system to incur extra cost. HealthGuard AI was created as a solution to the problem. HealthGuard AI is a Medicare fraud detection system since it uses machinelearning along with explainable AI withreal-time processing. It employs the Isolation Forest technique to detect the odd behaviour and then altogether the XGBoost and LightGBM machines to identify both the ancient and the modern fraudulent. It also reduces the number of false alarms by around 60%, which means more than $10 are received back for everydollarspent.

Keywords:

Healthcare Fraud Detection, Medicare Claims Analysis, Machine Learning, Anomaly Detection, Explainable Artificial Intelligence (XAI), Real-Time Data Processing, XGBoost, LightGBM, SHAP, Kafka-Based Streaming Systems.

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Machine Learning Approaches for Credit Card Fraud Detection: Addressing Class Imbalance Through Data Balancing

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Abstract:

The rapid increase in credit card usage has resulted in a significant rise in fraudulent transactions, making accurate fraud detection a critical challenge for financial institutions. Machine learning techniques are widely applied to this problem; however, the extreme class imbalance present in real-world datasets—where fraudulent transactions represent only 0.17% of total records—often leads to biased models with misleadingly high accuracy. This study presents a comparative analysis of data balancing techniques to improve fraud detection performance. Four machine learning classifiers, namely Logistic Regression, Decision Tree, XGBoost, and Artificial Neural Networks, are evaluated on an imbalanced credit card transaction dataset. Although XGBoost initially achieved high precision and accuracy, further analysis revealed biased classification results. To address this issue, Random Undersampling, Random Oversampling, and the Synthetic Minority Oversampling Technique (SMOTE) are applied. Experimental results demonstrate that Random Oversampling combined with XGBoost provides the most effective and unbiased performance, achieving an accuracy of 0.998, a precision of 0.997, and a recall of 1.0. The findings highlight the importance of appropriate data balancing techniques in enhancing fraud detection systems and supporting reliable data-driven decision-making in financial security applications.

Keywords:

Logistic Regression, Decision Tree, XGBoost, and Artificial Neural Networks, XGBoost, SMOTE, Under Sampling, Over Sampling.

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Governance-Aware Agentic Generative Deep Learning Framework for Adaptive and Physically Consistent Underwater Image Enhancement

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Abstract:

Image enhancement of underwater (UIE) is a real challenge because of the wavelength-dependent light absorption, forward scattering, back-scatter noise and non-uniform lighting characteristics that occurred in dynamic underwater conditions. Even though modern deep-learning practices are often used to smooth the quality of perceptions, they often undermine physical consistency, adaptive decision-making and governance-aware deployment. This paper, therefore, proposes the Governance Aware Agentic Generative Deep Learning Framework (GA-AGDLF) an integrative framework that binds diffusion-based generative modeling with agentic reinforcement-learning controller that has the capacity to dynamically adapt the enhancement policies to the characteristics of the scene. Physics informed weight term requires color fidelity and structural consistency but a governance layer has requirements of explainability, hardness and safety at work. Independent assessments of benchmark datasets of UIE4, RUIE, VI4 depict that GA-AGDLF outperforms state-of-the-art models in metrics such as UIQM, UCIQE, PSNR, SSIM and 00.delta. The studies of ablation also support the central positions of the agentic controller and the governance constraints. The framework, therefore, presents a scalable, reliable Artificial Intelligence framework on autonomous marine vision systems to ensure that image enhancement is both physically sound and informed by clearcut safety-first principles.

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Deep Learning-Based Indian Currency Recognition and Counterfeit Detection System with Voice-Guided Assistance for the Visually Impaired

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Abstract:

Visually impaired individuals in India often face significant challenges in identifying currency denominations and distinguishing genuine notes from counterfeit ones, leading to financial insecurity, dependency on others and vulnerability to fraud. Existing solutions such as manual assistance or basic currency recognition apps lack accurate fake note detection, real-time guidance, and multilingual accessibility, making them unreliable in practical situations. To address these limitations, this project proposes an AI-powered Indian currency recognition and counterfeit detection system that provides end-to-end assistance through an intelligent voice-guided interface. From application startup, the system delivers real-time audio instructions to help users correctly position the currency note in front of the camera for clear image capture. Advanced deep learning models, including YOLOv5 and Convolutional Neural Networks(CNN), are employed to accurately detect the denomination and analyze essential security features such as watermarks, security threads, and design patterns to verify authenticity. The final result-denomination value and genuine or fake statue-is delivered through multilingual voice output , including English and Tamil. By integrating computer vision, artificial intelligence, and speech technology, the system enhances financial independence, security, and confidence for visually impaired users.

The system they propose works on mobile devices, which is good because it means more people can use it without needing fancy equipment or anything expensive. I think the idea is to make it accessible for everyone, especially those need it most. They trained the model with a bunch of Indian Currency pictures taken in all sorts of ways, Like different lights and angles, even messy backgrounds. That helps it handle real situations better, you know , not just perfect lab stuff. Data augmentation was used too, to boost accuracy and avoid overfitting, or at least that's what is seems like from the description. Real-time detection is part of it, so responses come fast without the user having to tweak things all the time. If feels seamless that way. For visually impaired users, there's text-to-speech and speech recognition built in. Hands-free operation makes sense for that group, I guess it reduces frustration. Some parts might still need more testing though, like hoe well.

Keywords:

Currency Recognition, YOLOv5, Conventional Neural Network(CNN), Voice Assistance, Multilingual Support.

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Computationally Efficient Gated Recurrent Unit-based Neural Control for Near-Surface Interaction of Autonomous Aerial Robots

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Abstract:

Autonomous aerial robots capable of safe physical interaction with the environment are essential for inspection and maintenance tasks in confined and contact-rich scenarios. However, designing intelligent control systems that can robustly regulate near-surface motion remains challenging due to aerodynamic-contact coupling, sensing uncertainties, and unmodeled dynamics. This paper presents the design and learning-based control of an autonomous aerial robot, integrating a recurrent neural controller within a closed-loop system architecture for safe environment interaction and operating without explicit system modelling. The proposed controller adopts a lightweight recurrent-feedforward architecture (GRU-Gated Recurrent Unit) as the core control intelligence, directly operating in feedback with the quadrotor dynamics. The proposed framework is implemented on a custom-built micro aerial robot and validated through real-time experimental trials. Results demonstrate stable distance regulation, smooth control responses, and robust performance during close-proximity flight, underscoring the effectiveness of integrating system design and learning-based control for safe physical interaction in smart and autonomous aerial robotic systems.

Keywords:

Smart Robots, Autonomous robotic system, Learning based control, physical interaction control, Neural Network Control.

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POWER Framework: A Reliability-Infused Contract-Driven Enterprise Architecture for TypeScript-Based Business Systems

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Abstract:

Enterprise systems establish requirements which demand architectural systems to provide both reliability and scalability and configurability and controlled evolution capabilities. The traditional object-oriented software frameworks encounter problems because they maintain tight connections between objects and enforce strict object relationships and they restrict the full development of system functions while creating extra work for maintenance. The POWER Framework serves as a contract-based system which combines operational reliability with enterprise running architecture that developers built using TypeScript programming language. The framework establishes Business Machine Templates (BMTs) and a centralized POWER Facilitator and contract binding mechanism for selective inheritance and a reliability infusion system which externalizes dependency management and lifecycle control. The architecture combines concurrency control annotations with OSI layer networking abstractions and persistence infusion methods and enterprise beans which use machine learning technology to form a complete enterprise execution system. The validation process of the framework involved testing a real-world financial transaction system which handled 1.5 million records while maintaining 5,000 simultaneous users. The experimental findings demonstrate:

- The average response time decreased by 39% from 640 milliseconds to 390 milliseconds.
- The system experienced a 71% throughput increase which raised its capacity from 210 requests per second to 360 requests per second.
- The system achieved a 78% decrease in code duplication which dropped from 27% to 6%.
- The organization achieved a 57% reduction in the resources needed for deployment.

The POWER Framework enables organizations to achieve better system performance through its modular design which guarantees operational reliability and system scalability while maintaining enterprise system stability.

Keywords:

Enterprise Architecture, TypeScript, Reliability Infusion, Dependency Injection, Contract-Based Design, Business Machine Template, Concurrency Control, OSI Integration, Persistence Engineering.

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Post-Quantum Cryptography in Network Systems: A Review with Implications for SDN

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Abstract:

Shor's algorithm can factor RSA keys and solve the discrete logarithm problem underlying ECC, which means TLS and IPsec, as currently deployed, will not hold up against a cryptographically relevant quantum computer. The research community has responded by testing NIST-standardized lattice-based schemes, primarily Kyber and Dilithium, across 5G, IoT, satellite, and data center environments. This paper surveys that work from 2024–2025.

The review focuses on three measured costs: handshake latency, CPU overhead, and packet size growth. The most consistent finding across studies is that PQC public keys and ciphertexts are large enough to trigger IP fragmentation in some configurations, which adds retransmission delay. What the literature has not addressed is how these tradeoffs apply to the SDN control plane specifically, where the OpenFlow channel between controller and switch operates under different timing and trust assumptions than general-purpose protocols. This review frames that gap and outlines what a targeted study would need to measure.

Keywords:

Quantum-Safe Networks, PQC, 5G Security, Kyber, SDN Gaps.

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Reimagining Contemporary Fashion Through Smart Textiles: Fabric to Function

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Abstract:

Once Amber Jae Slooten said, "The future of fashion is not about technology replacing designers, but about how designers can use technology to create new forms of beauty," underscoring the importance of aesthetic integration in wearable technology research. Smart textiles are linkage between - engineered technologies and fashion by incorporating responsive features, such as embedded sensors, into fabrics and garments. While wearable technologies are primarily developed for medical applications like health tracking and monitoring where often lack visual appeal and design integration. The study adopts a design-led methodology involving material experimentation and prototype development to explore the integration and potential of responsive technologies into everyday apparel emphasizing comfort, flexibility, and ergonomics, along with the use of innovative materials that naturally blend technology with aesthetics. Ultimately, the study focuses on a framework that guides the transformation of smart textiles into sophisticated and contemporary wearable pieces. This framework demonstrates how everyday clothing can become interactive and responsive without compromising aesthetic value, maintaining visual and design integrity.

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Neurophysiological Effects of Immersive VR and Real-World Meditation: An EEG and HRV Study

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Abstract:

Immersive virtual reality (VR) environments are increasingly used to enhance meditative engagement; however, their neurophysiological impact relative to real-world practice remains insufficiently characterized. This study aimed to compare cortical and autonomic responses during immersive VR and real-world kirtan meditation using electroencephalography (EEG) and heart rate variability (HRV) analysis in 26 participants. Multivariate Iterative Filtering (MIF) was employed to decompose multichannel EEG signals into adaptive intrinsic mode functions, enabling robust spectral power estimation in frontal and posterior regions across alpha (8–13 Hz), beta (13–32 Hz), and gamma (32–60 Hz) bands. Pre–post paired comparisons revealed alpha-band modulation consistent with relaxation-related neural dynamics in both environments. Beta activity exhibited mild environment-dependent shifts, with immersive VR showing directional frontal beta suppression. Frontal gamma activity demonstrated the most distinct environment-specific effect: real-world meditation showed relative gamma enhancement, whereas immersive VR induced attenuation of frontal high-frequency oscillations. The VR–Real contrast revealed a significant relative reduction in frontal gamma power ($p = 0.029$, $d \approx -0.45$), indicating immersive-specific suppression of high-frequency cortical activity. HRV analysis showed decreased mean heart rate with increased RR intervals and RMSSD following meditation in both conditions, reflecting enhanced parasympathetic activation. Overall, immersive VR meditation preferentially attenuates frontal high-frequency neural activity while maintaining relaxation-associated autonomic responses, providing insight into how immersive technologies modulate neurophysiological mechanisms underlying meditative states.

Keywords:

Immersive virtual reality (VR), Kirtan meditation, Electroencephalography (EEG), Heart rate variability (HRV), Multivariate iterative filtering (MIF), Frontal gamma oscillations, Spectral power analysis, Autonomic regulation.

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A Review on Role of Styrene Butadiene Rubber in Enhancing Mechanical and Durability Performance of Cementitious Composites

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Abstract:

Concrete is the backbone of modern infrastructure but remains vulnerable to cracking across different scales, from microlevel shrinkage cracks to macrolevel structural fractures. These defects not only compromise mechanical performance but also accelerate durability problems. Styrene Butadiene Rubber (SBR) has emerged as a promising polymer modifier that enhances the toughness and durability of cementitious composites. By refining pore structure, strengthening the interfacial transition zone, and forming flexible polymer films within the matrix, SBR mitigates the initiation and propagation of cracks. The study focuses on mechanisms through which SBR improves the fracture energy, impact resistance and long-term durability. SBR has shown significant potential in enhancing the crack resistance of concrete across multiple scales while supporting goals. Continued research and practical validation will be essential to fully unlock its benefits for next-generation construction materials.

Keywords:

Styrene Butadiene Rubber, Durability performance, Crack resistance.

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Modern Optimisation and Technological Advancement for Resilient Smart Banking Systems

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Abstract:

The rapid digitalisation of the global financial ecosystem has necessitated the integration of advanced optimisation techniques and emerging technologies to enhance resilience in smart banking systems. This study investigates how modern optimisation models combined with artificial intelligence (AI), big data analytics, blockchain, Internet of Things (IoT), and next-generation digital infrastructure contribute to operational efficiency, cybersecurity robustness, and systemic financial stability. Adopting a structured analytical and systematic review approach, the paper develops a multi-layer conceptual framework linking technological infrastructure, optimisation engines, governance mechanisms, and resilience outcomes. Findings indicate that optimisation-driven technological integration significantly improves customer-centric service delivery, and ensures business continuity during crises, predictive risk assessment, fraud detection accuracy, liquidity management, and real-time decision-making capabilities. Furthermore, digital maturity positively correlates with institutional adaptability and systemic shock absorption capacity. The study provides strategic insights for financial institutions, regulators, and policymakers seeking to design intelligent, secure, and sustainable smart banking architectures. The proposed framework contributes to the literature by integrating resilience theory, dynamic capabilities, and digital transformation models within the context of modern banking optimisation.

Keywords:

Smart Banking Systems, Artificial Intelligence, Optimisation Modelling, Digital Transformation, Financial Resilience, Cybersecurity.

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CAAB: A Context-Aware Application Blocker Leveraging Convolutional Neural Networks and OCR for Enhanced Digital Child Safety

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Abstract:

Context Aware Application Blocker, (CAAB) is designed to provide a context-based system to improve a parent's ability to control the use of certain applications based on their child's age by automatically blocking access to applications when a user under the age of 18 is logged in. Utilizing computer vision and the MobileNetV2 machine learning architecture, CAAB monitors the current user's use of the computer with a webcam, and when a minor user is logged in, CAAB removes the appropriate application by terminating the program or process. Other forms of parental control generally are either password protected or set to a time-based limit and do not consider the physical state of the device when it is accessed. CAAB adds a new dynamic and real-time aspect to the digital safety of our children, through a time-based method to protect against access to application usage policies. The following paper will explain the physical architecture of the monitoring components of CAAB, including the monitoring of user and program/process management components, will provide information on the convolution neural networks designed to identify the user's age using the UTKFace data set, and have been optimized to operate using edge inference. The overall results show that this system provides an effective solution for access control by using a real-time, non-intrusive approach. Moreover, the integration of continuous visual context provides a significant improvement to the problems associated with using static access control, i.e. Restricting access to an application based on the physical presence of a User, instead of using only session-based credentials.

Keywords:

Computer Vision, Machine Learning, MobileNetV2, Child Safety, Parental Control, Real-time Inference, Process Management.

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Asanaguide -Net: Vision-Guided Realtime Yoga Alignment Correction using a Keypoint Deviation Engine (KPDE) and Instantaneous Visual Feedback

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Abstract:

In this project, the Keypoint Deviation Engine (KPDE) as a new computational module is presented as the fundamental part of the AsanaGuide-Net system. The KPDE is meant to address a gap in self-guided yoga that is critical, which involves giving real-time, accurate correction on alignment. AsanaGuide-Net is our deep learning and Human Pose Estimation (HPE) system that can identify the yoga postures first and then analyze them with any regular web camera or smart phone camera. This data is then fed into the KPDE module that processes an accurate angular error between the current pose of the user and an ideal reference model and provides immediate visual feedback to rectify misalignment. This real time correction engine is at the core of making yoga safe and effective with minimum errors in the execution of the postures. As a possible improvement, AsanaGuide-Net also offers optional Augmented Reality (AR) implementation, which renders a moving guide to further increase the understanding of a user. This piece illustrates a dependable, well-accessible and smart system of guidance of the future of self-practice and off-site fitness apps.

Keywords:

Artificial Intelligence (AI), Deep Learning (DL), Computer Vision (CV), Human Pose Estimation (HPE), Keypoint Deviation Engine (KPDE), Yoga, Alignment Correction, Real-Time Feedback.

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Applying Graph Neural Networks To Detect Anti Money Laundering in Crypto

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Abstract:

Money laundering is a significant threat to financial integrity in the world where it exploits the pseudonomous property of blockchain network and obscures illegal transaction flows on top of that. Classic Anti-Money Laundering (AML) strategies as rule-based heuristics, and standard machine learning solutions (ensued from those rules), are not able to effectively capture such complex relational structures in crypto currency transaction networks. In this work we use Graph Neural Networks(GNNs) to address the problem of fraud detection in Bitcoin transactions due to their dual capability of learning on graph-structured data and capturing local transaction features, as well as propaganda influence spread. Our network adopts architectural structures (e.g. residual connections, linear refinement layers) to mitigate gradient vanish and improve feature flow. Experiments show that the more complicated GNN paradigms perform much better in classification, and significantly outperform the baselines on detection of illegal crypto currency activities. The study would help promote financial forensics methodologies and rein force AML systems for safer implementation of decentralized digital assets.

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Technology Gaps in Agriculture: Barriers to Accessing Modern Farming Technologies

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Abstract:

Agriculture continues to be the driving force for many developing countries, including India, where a substantial number of people rely on agriculture for their livelihood. In recent years, digital technologies such as mobile-based advisory apps, precision agriculture software, satellite-based monitoring systems, and online agricultural marketplaces have come up as game-changers to improve advancement's and their effective implementation on the ground. This paper discusses the prevailing technology gaps in Indian agriculture and explores the socio-economic, infrastructure, and institutional factors that impede farmers' access to advanced farming technology. The major drawbacks include low digital literacy, poor rural infrastructure, high capital investment costs, disjointed extension services, and a lack of awareness about the availability of digital platforms. The paper also discusses the importance of public policies, financial institutions, and public-private partnerships in facilitating the inclusive diffusion of technology. By highlighting the major constraints and recommending strategic interventions, this paper hopes to make a policy contribution to the debate on bridging the digital divide in agriculture and promoting sustainable rural development.

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Voice-Centric Analysis of Voice Assistants using Large Language Models: A Survey and Experimental Study

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Abstract:

Voice Assistants (VAs) have become a part of human-machine interaction, making it possible to interact in a way of natural languages without hands-free interaction in various applications. There are still problems of poor accuracy of speech recognition, contextual comprehension and generation of responses despite being widely adopted. This paper research is on Large Language Model (LLM) integration to improve VA capabilities. We used dual-methodology design that involved a questionnaire survey and experimental analysis based on a model designed in Python Flask. The model combines several LLM APIs, Google Speech recognition (GSR) library of speech-to-text conversion, and windows Sapi voice engine of text-to-speech synthesis. An analysis of the surveys will show the preferences and trust of the users to Siri, Google Assistant/Gemini, Alexa and Cortana as well as their usage. The results of the experiments with 30-question test package in education, finance, technology, stock market, current events and future trends domains show that LLM-enhanced VAs have better accuracy on domain-specific queries followed by high enhancement in response relevance, accuracy of comprehension and completeness of information. This study not only provides empirical evidence of the effectiveness of the integration of LLM into voice assistance technology, but also offers implications when designing a context-aware conversational AI in the future.

Keywords:

Voice Assistants, Large Language Models, Natural Language Processing, Speech Recognition, Conversational AI, Human-Computer Interaction.

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An Optimization-driven Integrated Model for Automated Speed Regulation

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Abstract:

Vehicle overspeeding remains a major cause of road accidents seriousness which demands more accurate and dynamic speed control management systems. Prevailing approaches such as mechanical speed governors. Intelligent Speed Assistance (ISA), Adaptive Cruise Control (ACC), and AI-based predictive control have shown individual performance, however, there are separate implementation limits overall maximization of vehicle functioning under changing traffic conditions.

This paper proposes a consolidated multi-layer speed control model that merges hard threshold execution, real-time speed limit analysis through camera and GPS inputs, adaptive vehicle-to-vehicle gap supervision, and predictive optimization using traffic, weather, and road condition data. The proposed system design aims to enhance vehicle speed with respect to protection, fuel economy and legal adherence while ensuring system stability across changing driving conditions.

A systematic literature review shows the lack of a fully integrated combined model merging these four methods into a single performance-oriented structure. The proposed system is developed for scalability, enabling future upgrades such as inter-vehicle communication, personalized speed modeling, incident-aware control, efficiency-focused optimization for electric vehicles, and compatibility with self-driving systems.

The framework contributes towards improved, smart, and expandable speed management for future transportation systems.

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Enhanced Sentiment Aware Machine Learning Framework for Improved Cyberbullying Detection on Social Media

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Abstract:

Cyberbullying has become a serious problem on social media platforms, where individuals face repeated harassment, abuse, and harmful messages. With the increasing use of digital communication, there is a strong need for systems that can automatically detect and control such negative behavior. This project focuses on developing an intelligent cyberbullying detection system to identify harmful and abusive content shared online. The system uses sentiment analysis along with machine learning and deep learning techniques to detect cyberbullying accurately. It includes text preprocessing, contextual analysis, and user behavior evaluation to recognize both direct and indirect forms of bullying. The framework also supports multiple languages and analyzes different types of data such as text, images, videos, and metadata. In addition, explainable artificial intelligence is used to make the model's decisions clear and understandable. The system is designed to work in real time and can be applied to various social media platforms. Overall, this project helps promote safer, more positive, and responsible online communication.

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Privacy-Preserving Deep Learning Framework for Secure Blockchain-Based Online Transactions

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Abstract:

As online transactions are growing at a very high speed, it is important to have adequate security and privacy. In this study, a system is proposed, which combines blockchain technology and deep learning to enhance the security of transactions by detecting intelligent fraud and secure data management.

Blockchain offers the decentralized and resistant factor of transactions and deep learning can be used to understand and analyze trends in transactions to identify the possible threat with high accuracy (96.8% rate of fraud detection).

The system is used in a system that preserves user privacy and it includes:

- Probabilistic encryption to conceal users.
- Compliant plans to safeguard the transaction information.
- No-knowledge verifications to certify transactions without providing any confidential data.
- Federated learning and homomorphic encryption to learn with the protection of sensitive data.

The suggested architecture provides secure, confidential, and smart online transactions preserving the anonymity and privacy of the user and their data.

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Environmental, Public Health, and Economic Implications of Crop Residue Burning in Northern India: A Case Study of Punjab and Haryana

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Abstract:

The present research paper provides a detailed analysis of the serious issue of crop vestige burning in the agriculturally important states of Punjab Haryana in North India and its effect on the environment, people's health and economy. India produced about 500 million tonnes of agricultural vestige every year, of which about 100 million tonnes are burnt in the fields. Punjab and Haryana Alon, estimated generated 25–25 million tonnes of stubble every year of which 18–20 million tonnes are burnt. From an environmental perspective, burning one tonne of stubble releases approx. 1400 - 1500 kg of Carbon dioxide, 65 kg of Carbon monoxide and 6 kg of highly hazardous PM2.5 particles into the atmosphere. During October-November, this activity causes the Air Quality Index (AQI) in Delhi-NCR region to increase by 3 times the normal level to 450. Examining the health impacts, it is found that approximately 44,000 to 98,000 people die prematurely in India every year due to stubble smoke. Fine particles like PM2.5 can penetrate deep into the lungs and causes disease like asthma, cancer and heart disease. According to economic analysis, farmers burnt stubble due to lack of time and high cost of machinery. Although the government provides 50–80% subsidy on equipment like Happy seeder, it's enforcement at the ground level is flawed. In conclusion for a permanent solution to this problem, only fines are not enough, but it is imperial to promote "waste to wealth" businesses like bio- CNG and making pellets from stubble.

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