CONFERENCE PROCEEDINGS

17th INTERNATIONAL CONFERENCE ON SCIENCE AND INNOVATIVE ENGINEERING 17 ICSIE 2026

26th - 27th April 2026

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17th INTERNATIONAL CONFERENCE ON "SCIENCE AND INNOVATIVE ENGINEERING – 2026" (ICSIE – 2026)

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ORGANIZATION OF SCIENCE AND INNOVATIVE ENGINEERING & TECHNOLOGY (OSIET)

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In Association with

PRINCE DR. K. VASUDEVAN COLLEGE OF ENGINEERING AND TECHNOLOGY

Medavakkam - Mambakkam Road, Ponmar, Chennai – 600 127

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Manipal University College Malaysia (Melaka Campus)

Melaka, Malaysia

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ICSIE 2026

Proceeding of 15th International Conference on Science and Innovative Engineering

26th & 27th April, 2026

Organized by:

Organization of Science and Innovation Engineering & Technology

(OSIET), Chennai

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CHAIRMAN'S MESSAGE

I am delighted to welcome you all to the International Conference on Science and Innovative Engineering" (ICSIE 2026) which brings together experts and academics from around the world. The conference this year has brought together a tremendous and rich diversity of authors and speakers from universities, government and industry to share ideas and new perspectives on a wide range of Communications, Electronics, Networking, Computer Science, Mechanical and Electricals research and technologies. Addressing the new technical and business issues are essential to advance in today's engineering and technological environments. In order to provide an outstanding technical level for the presentations at the conference, we have invited more than 15 distinguished experts in the Engineering and Technology field to participate in the Advisory Committee. Academic excellence has always been the hall mark of our institute and we are committed to provide a comprehensive education which seeks to develop the students into academically proficient, morally upright and socially well integrated individuals. I would like to express my thanks to all authors for their outstanding contributions and in particular the members of the program board for their competent evaluation of the large number of submissions

We are very pleased with the quality, depth, and breadth of this year's technical program. I wish you a most enjoyable experience at the Conference.

Dr.K.Vasudevan

Chairman
Prince Group of Educational Institutions

VICE CHAIRMAN'S MESSAGE

The words "Engineering" and "Technology" are not just words but are vital disciplines that guide the world by bringing huge changes to the current way of living. Modern Engineering and Technological innovations are making people think that nothing is impossible in this world. Everything can be achieved with an extremely powerful vision and a path to attain that vision. If a person is doing a marvel, keep in mind that you too can outshine them with perseverance. Dr. A. P. J Abdul Kalam said "Dream is not something that comes when you sleep, it is something that doesn't let you sleep", so, dream a lot about how to bring changes and try to make the changes come true. Remember earning money is not life; it is just a part of life which can be easily earned when you do it with dedication. Science and technology have become so closely intertwined, and I hope the conference will help you to reinforce each other.

We are very much elated in welcoming you all to our college for the 17th International Conference on Science and Innovative Engineering and I wish the students all the very best for their presentations.

Dr. V.Vishnu Karthick,
Vice Chairman,
Prince Shri Venkateshwara Padmavathy Engineering College.

ADMINISTRATIVE OFFICER'S MESSAGE

The world is growing fast in fact it grows in such a way that a thing invented yesterday becomes obsolete today, which means there is a plethora of competition in each and every discipline of engineering and technology. This scenario goes well with a famous quote of a philosopher Heraclitus, who said, "Change is the only constant in this world." Nowadays people need new inventions for their daily works so that they can do it with ease. People not only need to do their activities with ease but they also need it to be done within a period of time. As an engineer we need to solve problems that are left unsolved. As a way of showcasing the talents of young minds to find solutions we have organised this 17th International Conference on Science and Innovative Engineering.

I welcome you all to this event, my warm wishes to the students who are going to present their papers and also hearty thanks for the staff who have made this event a great success.

Er. K. Parthasarathy

Administrative Officer

Prince Group of Educational Institutions

PRINCIPAL'S MESSAGE

I am indeed most delighted to chair this 17th International Conference on Science and Innovative Engineering (ICSIE 2026). The sharp, clear sighted vision and precise decision making powers of our management has benefited our college to stay competitive. The Pedagogy at the Institute is Modern where a variety of learning, behavioural tools are used in quality pursuance of knowledge, development of skills, attitudes, and values complemented by academia-industry interface imparting uniqueness to our programme. The Institute focuses on the holistic development of its students through variety of methodologies and extracurricular activities the whole year round. Today, we live in an era of incredibly rapid technological change. Technology has dominated our lives and we now have the ever evolving technology at our finger tips. Symposium, Seminars and International Conferences and Workshops are organized in the institute for their overall development. Teaching and Research are the two primary activities through which we fulfil our Mission and Objective. The Institute takes pride in welcoming the National and International participants for 17th International Conference.

With a firm foundation of the past and high hopes for a bright future, I wish everyone good luck and prosperity ahead. May we grow many technological wings!

Dr. T.Sunder Selwyn
Principal
Prince Dr. K. Vasudevan College of Engineering and Technology.

It's an honour for me to be a part of ICSIE 2026 - the 17th International Conference on Science and Innovative Engineering organized by Prince Dr. K. Vasudevan college of Engineering and Technology, Chennai, Tamil Nadu, India. The objective of this conference is to share knowledge, innovative ideas, various streams experiences and innovations in research and academia.

It's our privilege to have eminent personalities across the globe to enlighten and provoke about the advances in engineering and medical sciences.

I believe that this conference will provide valuable, useful and informative ideas to participant students, researchers and other experts.

I convey my best wishes for success of event.

DR. ANTENEH MESFIN YENENEH
ASSOCIATE PROFESSOR
CHEMICAL ENGINEERING
INTERNATIONAL MARITIME COLLEGE OMAN, SOHAR, OMAN

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
Autonomous Institute | Affiliated to Osmania University

Technical Education is the backbone of every nation and is the stepping stone for a country to move into the niche of a developed nation. India Entrepreneurs are emerging as a global Entrepreneur, Indian figuring increasingly in the list of the richest persons in the world. India's knowledge power making India as a preferred destination for outsourcing knowledge services from India. India is fast emerging as a destination for world class R&D centres and innovation hub. Young friends they are the signs of even a brighter tomorrow for India and its people.

You must therefore be highly excited to make your own contributions to the growth and development of India as a dream.

As a Keynote speaker of the 17th International Conference on Science and Innovative Engineering (ICSIE 2026), I congratulate all the participants who have contributed their technical articles in the proceedings.

DR. G. N. R. PRASAD
ASSOCIATE PROFESSOR
DEPARTMENT OF MCA
CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
GANDIPET, TELANGANA, INDIA

ABOUT INSTITUTION

Prince Educational Society was established in 1978 by our Founder - Chairman Dr. K. Vasudevan, M.A., B.Ed., Ph.D. Going down memory lane in the seventies, our Chairman had realized the need for an Institution which will serve as a role model and stand apart from other Educational Institutions.

VISION

The main aim of Prince Dr. K. Vasudevan College of Engineering & Technology is to meet the challenges and demand of the highly advanced scientific and technological fields and to prepare to meet the man power needs of the world.

MISSION

To provide goal-oriented, quality-based and value-added education through state-of-the-art technology on a par with international standards. To promote nation - building activities in science, technology, humanities and management through research. To create and sustain a community of learning that sticks on to social, ethical, ecological, cultural and economic.

About PDKVCET

Prince Dr.K.Vasudevan College of Engineering and Technology has emerged as one of the fastest growing institutions of higher learning in India. We started out as a modest institute in 2009, to serve the needs of the local community. Today, as we enter the 17th year, as a flagship institute, we continue to be in service of country and society. Prince Dr.K.Vasudevan College of Engineering and Technolgy has a plethora of traditions that make the institute a unique and truly special place. Our institution that produces the next generation of leaders and advances tomorrow's thinking. Prince Educational Society was established in 1978 by our Founder - Chairman Dr. K. Vasudevan, M.A., B.Ed., Ph.D. Going down memory lane in the seventies, our Chairman had realized the need for an Institution which will serve as a role model and stand apart from other Educational Institutions. The setting up of Prince Matriculation Higher Secondary School, Nanganallur, Chennai, helped in the evolution of Prince Matriculation Higher Secondary School, Madipakkam, Chennai, which met this need. In order to serve the poor and the needy, he started a Tamil Medium School as well. Today this educationist, Industrialist and pioneer heads an Arts and Science College and an Engineering College in Chennai. These Institutions aim at imparting quality education in the fields of engineering, arts and science.

OUR GROUP OF INSTITUTIONS

Prince Shri Venkateshwara Padmavathy Engineering College

Prince Dr. K. Vasudevan College of Engineering & Technology

Prince Shri Venkateshwara Arts and Science College

Prince Matriculation Higher Secondary School,7,Kannagi Street, Madipakkam to Puzhuthivakkam, Chennai 091

Prince Sri Vari Vidyalaya CBSE School,93 ,College Road , Nanganallur, Chennai 114.

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Shri Venkateshwara Higher Secondary School, 9,Kannagi Street, Madipakkam to Puzhuthivakkam, Chennai 91

Prince Matriculation Higher Secondary School, 67&68, College Road, Nanganallur, Chennai 114.

ICSIE 2026

PATRON-IN-CHIEF

Thiru. Dr. K. Vasudevan, M.A., B.Ed., Ph.D,

Chairman, Prince Group of Educational Institutions.

Thiru. Dr.V.VishnuKarthik, MD, Vice-Chairman, Prince Group of Educational Institutions.

SECRETARY

Er.K.Parthasarathy, B.E,

Administrative Officer, Prince Group of Educational Institutions.

CONFERENCE CHAIR

Dr.Sunder Selwyn, Principal,
Prince Dr.K.Vasudevan College of Engineering

KEYNOTE SPEAKERS

Dr. Anteneh Mesfin Yeneneh, Associate Professor, International Maritime College Oman, Sohar, Oman

Dr. G. N. R. PRASAD, Associate Professor, Chaitanya Bharathi Institute of Technology, Gandipet, Telangana, India

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124	ICSIE2601788	COMPARATIVE ASSESSMENT OF MACHINE LEARNING ALGORITHMS FOR LANDSLIDE SUSCEPTIBILITY MAPPING IN THE NILGIRIS DISTRICT, WESTERN GHATS
125	ICSIEDR2602122	MULTI DRUG-DRUG INTERACTION (MDDI) THROUGH SEQUENCE PARSING AND N-GRAM ANALYSIS
126	ICSIE2601412	COMPARATIVE ANALYSIS OF ZERO-SHOT AND FEW-SHOT PROMPTING FOR LEGAL DOCUMENT SUMMARIZATION USING LARGE LANGUAGE MODELS
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130	ICSIEDR2602085	AI-DRIVEN HEALTH ANALYTICS FOR CERTIFICATION OF REUSABLE LAUNCH VEHICLE AVIONICS
131	ICSIE2601709	LUNG CANCER DETECTION AND STAGE CLASSIFICATION USING DENSENET-169 ARCHITECTURE
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296	ICSIE2601442	AI-BASED VEHICLE ACCIDENT DETECTION AND AUTO-CLAIM SYSTEM
297	ICSIEDR2603255	MULTIMODAL LEARNING FOR AUTISM DETECTION, EMOTION RECOGNITION, AND COGNITIVE ENHANCEMENT
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300	ICSIEDR2602800	DRIVER DROWSINESS AND FACIAL EMOTION RECOGNITION SYSTEM USING VISION TRANSFORMER AND EAR+SVM MODEL

1.A FRACTIONAL APPROACH TO CHRONIC PULMONARY ASPERGILLOSIS CONTROL IN ICU SETTINGS

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In this article, a fractional-order model of chronic pulmonary aspergillosis in intensive care unit patients is developed. The solution singularity is derived using fixed point theory. To determine the best control techniques, we introduce three control techniques using Pontryagin maximum principle. Laplace transform allows simulating the fractional-order derivatives analytically. Analytical simulation of fractional-order derivatives is carried out by using Laplace transform. A deeper comprehension of the chronic pulmonary aspergillosis transmission patterns resulted from an analysis of the graphical results.

2. MLO-OPTIMIZED MULTI-SCALE FUSION GATED GRAPH RECURRENT NETWORK FOR SECURING CLINICAL IOT WIRELESS NETWORK AND SENSITIVE CLINICAL DATA

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In modern healthcare and clinical environments, the rapid integration of connected medical devices and IoT-enabled monitoring systems has significantly increased the vulnerability of clinical networks to cyber threats. The protection of sensitive patient and institutional data in such heterogeneous wireless networks is crucial to ensure both privacy and uninterrupted medical services. To overcome these issues, the proposed work implemented a novel Multi-Scale Fusion Gated Graph Recurrent Network (MS-FGRN) to address anomaly detection. This proposed work includes three major components: (i) a Multi-Scale Temporal Convolution Extractor (MSTCE) for short- and long-term temporal patterns; (ii) a Graph Construction Layer (GCL) used for spatial dependencies; and (iii) a Fusion- Gated Unit (FGU) for adaptive multi-feature integration and heightened anomaly sensitivity. To attain a higher accuracy, the proposed MS-FGRN model's hyperparameters like filter sizes, graph weights, learning rates, and gate dimensions are tuned using a Modified Lemur Optimiser (MLO). This MLO model is inspired by velocity updates, dynamic step sizing, and leader-follower mechanisms that evaluate the higher optimal solution in hyperparameter tuning. The experimental results are validated using the standard datasets such as NSL-KDD, CIC-IDS2017 and BoT-IoT with classification metrics. The proposed MLO-optimised MS- FGRN attained a higher result in all the metrics than the conventional models. Therefore, the proposed MLO-MS-FGRN established a resilient IDS to secure heterogeneous wireless IoT ecosystems.

3. INTEGRATING CNN-LSTM FRAMEWORK BASED SPATIAL-TEMPORAL ANALYSIS FOR EFFECTIVE SIGN LANGUAGE GESTURE RECOGNITION IN FORENSIC AND SECURITY DOMAINS

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Gesture recognition based on sign language is significant in forensic investigations and security surveillance, especially when monitoring non-verbal communication in sensitive settings is required. Nevertheless, current recognition systems often struggle with complex spatiotemporal dependencies and real-world variations, such as lighting, occlusion, and signer variation. To overcome these issues, this paper will develop a combined Convolutional Neural Network-Long Short-Term Memory (CNN-LSTM) system that leverages spatial- temporal features of sign language to analyze sign language gestures for forensic and security applications. The proposed methodology uses a deep CNN to extract high-level spatial features of video frames, including hand shape, orientation, and movement patterns. An LSTM network is then used to process these spatial features in sequence to model temporal dynamics in a gesture sequence. The framework has been tested on benchmark sign language video datasets containing more than 25,000 gesture samples across various sign categories. The performance measures were accuracy, precision, recall, and F1-score. The results of the experiment show that the CNN-LSTM model achieved higher overall recognition rates (94.8) than the traditional CNN-only and handcrafted feature-based models, by 8.6 and 14.2, respectively. The proposed system was also found to be more robust under noisy, low- resolution conditions, achieving an accuracy of 92.1 in simulated surveillance. Moreover, misclassification of visually similar gestures was reduced by 31 % through temporal modeling with LSTM. Finally, the integrated CNN-LSTM is a robust, scalable system for recognizing sign language gestures in law enforcement and security applications. Its capability to capture spatial and temporal properties enhances its interpretability and operational effectiveness, thereby boosting its application in automated surveillance, evidence analysis, and inclusive security communication systems.

4. AUTOMATED DETECTION OF UNINSURED VEHICLES AND UNLICENSED DRIVERS FOR TRAFFIC POLICING

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Traffic policing plays a pivotal role in upholding road safety and ensuring compliance with regulations. However, conventional methods of identifying uninsured vehicles and unlicensed drivers have been labor intensive, time-consuming, and prone to human error. This research presents an innovative automated system for real-time detection of uninsured vehicles and unlicensed drivers, addressing critical challenges in modern traffic policing. We integrates advanced algorithms such as YOLO v7 for license plate detection, Bilateral Filters for image enhancement, easyOCR for optical character recognition, and CRNN for text sequence modeling. Additionally, DeepFace, DeepID, and ArcFace are utilized for driver face recognition to accurately identify uninsured or unlicensed individuals. The research findings highlight the high efficiency and reliability of the proposed automated system in detecting uninsured vehicles and unlicensed drivers within the Indian traffic management framework. Through a comparative evaluation of various license plate recognition algorithms, YOLOv7 was identified as the most suitable model for Indian license plate detection and recognition, achieving an impressive accuracy of 99.8%. Furthermore, the system demonstrated robust performance in driver identification through the ArcFace-based face recognition module, attaining an accuracy of 97%. These

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results collectively validate the system's capability to deliver accurate, real-time detection and identification in complex and dynamic traffic environments.

5.INTRUSION DETECTION BY TRANSFORMER MODEL WITH NSGA-II AND PSO OPTIMIZATION

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Securing a computer network infrastructure is the focus of the specialist field of network security in computer networking. Typically, a system administrator or network administrator is in charge of network security. The security policies, network gear, and software required to shield a network from unwanted access are put into place by administrators. In addition to hardware and appliances, network monitoring and security software are among the many components that make up a network security system, which typically depends on layers of protection. Together, the elements improve the computer network overall security. In addition to protecting and supervising the operations, it secures the network. The volume and complexity of the accessible data overwhelms traditional data mining approaches. Their execution time is mostly determined by the quantity of the processing data, and they have grown computationally costly. Some intrusion detection systems perform best against some attack types while performing poorly against others. Network performance is significantly impacted when effective intrusion detection systems are unable to identify minority attacks. Furthermore, IDS has a significant temporal complexity when all of the classifier's features are used. Therefore, these problems are addressed in this study by utilizing a variety of effective transformer models with NSGA-II and PSO intrusion detection approaches. This Intrusion Detection System (IDS) is an anomaly detection system that utilizes a Transformer-based model to identify intrusions through reconstruction error, employs NSGA-II + PSO for optimal feature selection to enhance efficiency, leverages advanced evaluation metrics (MCC, Balanced Accuracy, AUC) for reliable performance assessment, and can detect Zero-Day Attacks by recognizing unseen traffic patterns. This proposed IDS making it an optimized solution for real-world network security. Keywords: Intrusion detection, Threat, security, privacy.

6. NAVIGATION TOOL FOR REAL TIME EV CHARGING STATION LOCATION AND ROUTE OPTIMIZATION

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The quick expansion of the Electric Vehicles (EV) usage has led to the immediate necessity to develop clever and practical charging navigation solutions to manage the lack of available stations, range anxiety, and poor choice of the available route. This paper introduces ChargeMate, which is an intelligent and scalable architecture to assess and optimize EV charging navigation based on real-time analytics and multi- criteria decision-making. This research will concentrate on the evaluation of systems and the analysis of the performance of the algorithms, but not on the front-end or the design of the websites. ChargeMate combines geospatial analytics, traffic, and so-called state-of-charge (SoC) of vehicles to actively suggest the most appropriate charging stations. The structure makes use of Haversine distance calculation to create spatial estimation as well as a weighted multi-criteria scoring model that is based on travel time, availability of a station, charging rate, cost, and reliability. It was assessed based on publicly available data sets, including Open Charge Map or Plugshare and NREL Alternative Fuel Stations with 15,000 records of urban and suburban and highway charging stations. The outcomes of the experiment show that the most beneficial optimization factor according to the importance scores is travel time and station availability with weighted scores of 0.82 and 0.76 respectively. The suggested model will reduce the average waiting time by up to 63 percent, and the utilization of chargers is increased by 18 percent and the route efficiency is made 94.3 percent when compared with the traditional routing methods. These findings confirm that ChargeMate has a hybrid mechanism of making decisions and that it responds to the real- time differentiation of data in different locations. In general, the ChargeMate framework presents an effective reflection of a solid, evidence-based method of the EV charging navigation optimization. Being a successful integration of spatial analytics, dynamic scoring, and performance-based evaluation, it provides a powerful background of the future development of predictive and charging management and sustainable electric mobility system.

7. A COMPREHENSIVE REVIEW OF THE IDENTIFICATION OF COCONUT TREE DISEASES USING SEVERAL DEEP LEARNING TECHNIQUES

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Coconut farming plays a vital role in the economy of tropical agriculture; however, its growth is hindered by numerous coconut plant diseases that can reduce both the yield and quality of the harvest. Traditional methods of disease detection are often slow, susceptible to human error, and lack scalability. The trees are at considerable risk from various diseases such as stem bleeding, basal stem rot, and bud rot, which can impact entire plantations. Therefore, advancements in technologies such as computer vision, machine learning, and deep learning are instrumental in timely identification of plant diseases. This survey discusses the various algorithms employed for the detection of coconut plant diseases.

8. EXHIBITX: A SMART PROJECT EXHIBITION MANAGEMENT PLATFORM FOR ACADEMIC INSTITUTIONS

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Project exhibition is a significant academic activity for engineering students, but its management is done with manual or semi-automatic systems in most academic institutions. These traditional systems have several shortcomings, including poor coordination, lack of transparency, delays in the evaluation process, data redundancy, and system scalability. To overcome these limitations, this research proposes the design of an intelligent web- based Project Exhibition Management Platform called ExhibitX for academic institutions, catering entirely to the entire process of project exhibition management right from registration of students, submission of projects, plagiarism checking, allocation of evaluate/judges, marking/evaluation, scoring, and result generation. The platform provides role-based access for students, judges, coordinators, and administrators for secure and structured workflows. Fairness, efficiency, and transparency are enhanced through the use of intelligent modules such as automated project comparison, AI-assisted plagiarism detection, and real-time analytics dashboards. The modular architecture is designed to be highly scalable, using state-of-the-art web technologies to suit both small department-level exhibitions and large institutional events. Experimental evaluation reveals that ExhibitX makes significant impacts on reducing the workload for administrators, time consumption for evaluations, and human errors compared to traditional systems. The proposed platform offers a reliable, scalable, user-friendly solution for modern academic project exhibitions.

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9. KANMANI AI – A WEARABLE STEREO VISION-BASED ASSISTIVE DEVICE FOR INDOOR NAVIGATION OF VISUALLY IMPAIRED ELDERLY INDIVIDUALS

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Elderly people with visual impairments still struggle to navigate indoor environments. While they offer crucial assistance, traditional aids like white canes and guide dogs do not provide real- time awareness of obstacles or contextual cues [9]. In this work, we present Kanmani AI, a wearable assistive technology intended to improve autonomous and safe mobility. In order to identify obstacles [1], detect architectural features like stairs and doorways [3], identify people and rooms [7], and interpret text labels through optical character recognition, the device combines lightweight stereo cameras with a smartphone-based processing unit that runs optimized artificial intelligence (AI) models offline. Bone conduction earphones are used to deliver guidance, guaranteeing discreet and hands-free feedback. The system reliably identified obstacles and structural elements in controlled indoor trials, and after a brief period of familiarization, spoken instructions allowed participants to navigate on their own. Future additions, such as fall detection and health monitoring, are also supported by the modular design. This study shows that a small, easy-to-use wearable gadget that boosts independence and self-assurance for senior users with visual impairments can be created by fusing inexpensive hardware with effective offline artificial intelligence processing.

10. SUPER HYBRID DRONE FOR LOGISTICS TRANSPORTATION AND ORGAN TRANSPLANTATION

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The Advancements in the Drone industry and Million-Dollar funding for the Research & Development of it, makes the Domain a special one to explore. The urge to settle down the carbon emissions and pave way towards, Sustainable environments and Green energy makes us think of innovating new trends in the Domain and using technologies like Deep Learning on basis of Machine Learning Algorithms. A research and ideation to create a drone for reduced the energy consumption and deliver a high payload with better ranging fly-time made us create a unique design and Development of a VTOL drone which can deliver better payloads with increased fly- time, Making the drone autonomous and structuring a methodology for logistics and ration delivery made the project a worth-one. Now for the logistics, to reduce the boon in the tertiary chain we are planning to expand it with B2Bs, B2Cs and B2B2C acting as delivery partners, Ensuring a quick and Feasible deliveries.This Projects also provides the solution to the Existing problems in the design complications, Tertiary chain management, Manpower Demands, Sustainability actions.

11. A MULTI-ALGORITHM FRAMEWORK FOR BEHAVIOURAL AND TIME-SERIES BASED INTRUSION DETECTION IN SHARED E-COMMERCE SYSTEMS

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In modern household environments, a single e- commerce account is frequently accessed by both adults and children, which introduces uncertainty in recognizing the actual user behind each interaction. This shared usage diminishes clarity in user intent, weakens personalization accuracy, and increases vulnerability to intrusions that mimic legitimate account members. To mitigate these risks, this work proposes a unified defense model designed to continuously verify the user and detect suspicious activities within a shared account context. The system learns the distinct behavioral signatures of parents and children and automatically attributes every interaction to the correct user category without requiring explicit login credentials or manual verification. A hybrid analytical approach is implemented by combining statistical patterns with intelligent classification to uncover abnormal behaviors that deviate from familiar usage trends. The solution employs a group of powerful machine learning techniques—Random Forest, Isolation Forest, XGBoost, Logistic Regression, and Decision Tree to effectively differentiate genuine actions from potential anomalies. Model performance is rigorously evaluated with indicators such as accuracy, precision, recall, specificity, response time, and F1-score to ensure the framework is both dependable and efficient. Additionally, the integration of the NSGA-II multi-objective genetic optimizer significantly refines the outcome by minimizing false alert generation and improving decision consistency. A deep learning layer further strengthens system reliability by enabling automated identification of the active user during sensitive purchase events. Experimental results demonstrate that the proposed hybrid architecture not only improves cybersecurity in multi-user e-commerce accounts but also preserves recommendation quality by aligning decisions with the true user identity. The framework is designed to operate continuously without interrupting the user experience, making it suitable for real-world deployment. Time-based and session-level features play a key role in strengthening the distinction between normal and abnormal activities. The adaptive nature of the model allows it to respond effectively to changes in user behavior over time. By handling both security and personalization together, the system avoids the common trade-off between protection and usability. The comparative analysis further highlights the robustness of the proposed approach across multiple

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evaluation metrics. Overall, the model provides a scalable and intelligent solution for managing shared e-commerce accounts securely.

12. MACHINE LEARNING–BASED PREDICTION OF AIR CONDITIONER POWERCONSUMPTION CONSIDERING ROOM COLOUR AND PAINT CHARACTERISTICS

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Air conditioners represent one of the major contributors to electrical energy usage in indoor residential and commercial spaces, often resulting in increased operating costs and inefficient energy utilization. This study introduces a data-driven machine learning framework designed to estimate and optimize the electricity consumption of air conditioning systems by examining key environmental and structural parameters. The model integrates factors including ambient temperature, room dimensions, occupancy levels, interior colour, and paint thermal behavior to predict energy demand with improved accuracy. System performance is evaluated across varied input conditions to determine efficient operating scenarios. Visual analytics are employed to present consumption patterns in an intuitive manner for end users. Based on prediction outputs, the framework generates actionable recommendations aimed at reducing unnecessary energy usage while maintaining comfort. Additionally, a monthly cost projection is provided to assist users in planning and managing electricity expenses. Experimental evaluation confirms that the proposed framework achieves reliable prediction accuracy and delivers meaningful optimization guidance. By encouraging efficient usage and informed decision-making, the approach contributes to reduced energy consumption and supports sustainable smart energy management solutions.

13. MALWARE-SEQGUARD: AN APPROACH UTILIZING LSTM AND GRU FOR EFFECTIVE DETECTION OF EVOLVING MALWARE IN ANDROID ENVIRONMENTS

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The malware detection is necessary in the protection and integrity of Android devices that are undergoing. targeted because they are normally used and open-source. This paper will offer a hybrid model of learning, Malware- SeqGuard. that uses Long Short-Memory (LSTM) and Gated. GRU network to successfully detect emergent. Android malware. The proposed model makes use of sequential. possibilities of LSTM and GRU models to detect timedependency in behavioral data such as user activities, system logs, and network traffic to determine advanced malicious trends. that conventional methods are not able to sense. The dataset applied in more than 15,000 Android malware and benign exist in this paper. applications, which had undergone the normalization and the sampling method SMOTE to equalize the disproportion between the classes. Logistic regres- sion, decision tree, random forest. Among them are recurrent Neural Network (RNN), LSTM andGRU. performance-based baseline models. benchmarking. Based on the experimental data, it is possible to note that the proposed Malware-seqGuard model has an excellent accuracy. of 99.42 percent that is superior compared to its state- of-the-art. Android counterparts in Android malware detection. The confusion matrix analysis and the computation as well as the 10-fold crossvalidation. the model was also proved to be efficient through the use of complexity analysis. and that this model was strong as also practically feasible as to cellular implementation. Malware-SeqGuard is capable of detecting malware using both LSTM and GRU to a greater degree. accuracy and at the same time computationally efficient. scalable. The findings aim at the future of the hybrid deep learning. A model on how to enhance mobile cybersecurity, which provides a. presence of platform of robust, versatile, and resourceful reaction to fast evolving malware threats in the Android platform.

14. A DYNAMIC FRAMEWORK FOR BIAS DRIFT DETECTION AND MITIGATION IN REAL-WORLD AI DEPLOYMENT

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Fairness-aware machine learning methods mainly apply bias mitigation during model training, assuming fairness properties will remain stable after deployment. In practice, deployed AI systems operate in non-stationary environments where demographic composition, user behaviour, and outcome distributions change over time, which can cause fairness deterioration even when predictive accuracy remains stable. This paper presents a deployment-time fairness control framework that aims to detect and mitigate bias drift in real-world AI systems. The proposed architecture treats fairness as a temporal system variable and includes continuous fairness monitoring, variance-sensitive drift detection, and proportional adaptive mitigation all combined within a unified closed-loop architecture. Bias drift is identified through statistically adaptive thresholds derived from rolling fairness statistics, enabling robust separation of sustained disparities from transient variations. Corrective interventions are applied incrementally through dynamic re-weighting and threshold adjustment to avoid full model retraining and minimize service interruption. The framework is model-agnostic and can be embedded into existing machine learning pipelines with limited architectural overhead. Empirical evaluation on multiple benchmark datasets under controlled temporal and demographic shifts shows significant reductions in fairness instability while keeping predictive performance within statistically insignificant margins.

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These results support the feasibility of operationalizing fairness as a continuous lifecycle property, bridging the gap between fairness-aware learning, concept drift monitoring, and deployment-time regulation in high- stakes AI systems.

15. A DEEP LEARNING MODEL WITH CONVOLUTION NEURAL NETWORK FOR SUSTAINABLE AGRICULTURE BY AVOIDING WILDLIFE INTRUSION AND PREVENTION

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The proposed automated system seeks to alleviate the escalating conflict between humans and wild animals resulting from the destruction of crops by species such as elephants and wild boars. Farmers have traditionally used electric fences around their fields, which are harmful to wildlife. This system protects crops without hurting people or animals, making it a more humane option. It works by capturing images of certain an- imals in agricultural areas and analyzing those images to identify specific frequencies associated with those animals. When wildlife is detected, these frequencies act as non-invasive deterrents that safely keep animals away from the area. This approach not only improves crop protection but also promotes peaceful coexistence between humans and animals by using technology in an ethical and responsible way. Keywords include Arduino, automated system, image analysis, wildlife deterrent, crop protection, and non-invasive technology.

16. A REPORTING SYSTEM FOR CIVIC AND ANIMAL WELFARE ISSUES

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In towns and semi-urban districts, municipal and animal welfare problems, broken streetlights, broken roads, injured animals, and bad sanitation, is very common. Although these issues are influencing the daily life and public safety, still, they are hard to report in a systematic way. Manual methods are commonly used in current reporting methods. communication, are not structured and are slow. This paper describes a system having a simple interface which is easy to use. enables the citizens to report civic and animal welfare problems. Users can post pictures that will be used as a reference and data. about the issue. A admin reviews and processes the reported problems manually.The system helps to enhance citizen-authority communication through highlighting. responsibility, transparency and proper record keeping.

17. DETECTING FAKE MEDICAL NEWS USING MACHINE LEARNING TECHNIQUES

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Due to the widespread distribution of Fake Medical News on various internet platforms, it became a serious threat to public health and safety. Performance of the model is evaluated using metrics such as accuracy and precision. Explainable strategies are used to improve the model transparency. An intuitive user interface is created and made accessible by public through a web platform, for real-time authentic

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evaluations. The real-time monitoring system adjusts to new patterns of misinformation, cross validation and hyperparameter tuning which guarantee reliable model evaluation. Ethical considerations, privacy, and bias mitigation, including educational components to guide users, are addressed here. The evaluated algorithms used are CNN-LSTM in combination with Logistic Regression, XGBoost, are the prominent algorithms used in machine learning.

18. SAFETY SCOUT: VIDEO BASED ACCIDENT DETECTION

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This concept proposes the development of an advanced real-time video action detection system for the immediate identification of fire incidents and vehicle accidents using closed-circuit television (CCTV) camera networks. The system's primary objective is to detect critical events as they occur and promptly notify the relevant emergency response authorities, such as fire departments and ambulance services. Key technologies involved in this endeavour include computer vision techniques for object detection, specialized algorithms for fire recognition, and the utilization of convolutional neural networks for vehicle identification. The system aims to process video feeds in real-time, ensuring low latency, and generate alerts based on predefined confidence thresholds to minimize false positives. Furthermore, it incorporates secure data storage, scalability, and adherence to legal and ethical considerations related to surveillance. Overall, this concept addresses the critical need for an intelligent and proactive video surveillance system capable of enhancing public safety and expediting emergency response efforts.

19. DIGITAL SCENT TECHNOLOGY

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The digitalization of taste parallels the digitalization of smell, also referred to as olfactory technology or technologies using an olfactory representation. Although olfaction works quite differently than the other senses (especially as compared to taste, which is a poor sense) in that the male and female senses of smell no longer share any similarities, they still do provide the ability to detect or identify the presence of a specific substance in the air that gives off an odor (odoran) when you breathe in that substance. After we consume food primarily through mastication, the taste/odor of that food is created in our brain and contributes to creating a bond between people. Additionally, smell is strongly associated with emotions and memories. This research proposal will address finding, transferring, and receiving geo-located digital content through the use of scent enabled e-games, and other types of digital scent based entertainment along with the use of scent in therapeutic uses for individuals with either affective or sensory disabilities. The binding of the odorant to the receptor located on the olfactory neuron creates very specific responses to produce the overall sense of smell. Our dataset is created using neural networks, which is a subset of machine learning. This also applies to the generation of the scents of gunpowder, burning rubber, or bodily fluids as they relate to emotions associated with that experience, so it is more effective than just using video and sound; therefore, this is why field medics utilize this training for preparing for real- life scenarios.

20. CARDIOVASCULAR CARE USING A HYBRID ML/DL FRAMEWORK FOR EARLY DETECTION AND REAL-TIME MONITORING

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Cardiovascular diseases (CVDs) have remained the leading cause of the morbidity and mortality worldwide, which emphasizes the critical need for an early detection, continuous monitoring, and a precise risk stratification. The recent advances in machine learning (ML) and deep learning (DL) have allowed the development of a robust, data-driven frameworks that is capable of analyzing the heterogeneous cardiac data, which includes the electrocardiography (ECG) signals, imaging modalities, and the laboratory biomarkers. This survey has provided a comprehensive review of conventional ML methods, deep learning architectures, and the hybrid frameworks that is applied to the cardiovascular care. The conventional classifiers such as support vector machines, random forests, and the gradient boosting methods have shown the efficiency and interpretability, which is specifically for structured data. Deep learning models, which includes the convolutional neural networks, recurrent neural networks, graph neural networks, and the generative models, performs well at capturing the complex spatial, temporal, and the multi-modal patterns, which enhances the disease detection and prediction accuracy. Hybrid ML/DL frameworks have combined the feature extraction and classification across the multiple data types, which achieves a superior robustness and clinical applicability. The real-time monitoring and clinical decision support systems have exploited the edge computing, low-latency inference pipelines, and the wearable or telemetry devices, which allows a timely intervention and a continuous patient surveillance. The survey also has addressed the challenges such as data heterogeneity, limited multi-modal datasets, computational complexity, interpretability, and the

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regulatory compliance. Emerging trends have focusses on multi-modal fusion strategies, explainable AI, synthetic data augmentation, personalized longitudinal modeling, and the federated learning as future directions to improve the generalization, reliability, and the real-world deployment. By the consolidation of methodologies, datasets, evaluation metrics, and the clinical case studies, this review has provided a roadmap for researchers and clinicians that seeks to develop an explainable, efficient, and the high-performance ML/DL frameworks for the cardiovascular healthcare.

21. IMAGE CAPTION GENERATION USING DEEP LEARNING

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Image Caption Generation is presented in this paper using deep learning techniques that combine Computer Vision and Natural Language Processing to generate meaningful textual descriptions for images. The proposed framework utilizes a Convolutional Neural Network (CNN) to extract visual features from images and a Long Short-Term Memory (LSTM) network to generate corresponding captions. The system efficiently interprets the visual context and produces grammatically correct sentences that describe the image content. To improve caption accuracy, the model is trained on the MS COCO dataset, which contains diverse real-world images and captions. Additionally, the system incorporates evaluation metrics such as BLEU and METEOR scores to measure caption quality. Experimental evaluation shows that this method achieves high accuracy and fluency, making it suitable for applications such as visually impaired assistance, image retrieval, and content tagging.

22. HEALTHDESK: A MULTILINGUAL VOICE-ENABLED AI CHATBOT FOR SMART HOSPITAL ASSISTANCE

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Healthcare services frequently face communication barriers due to language problems and limited seats of medical staffs. This paper presents HEALTHDESK, a multilingual voice-enabled AI chatbot designed to help the patients and visitors by providing hospital-related information through both voice-based and text-based. The proposed system integrates Natural Language Processing (NLP), Speech-to-Text (STT), and Text-to-Speech (TTS) technologies to communicate in multiple languages which includes English and Tamil. HEALTHDESK supports services such as doctor availability, emergency contacts and general health queries, which reduces the workload of hospital staff and improve the accessibility for elderly and rural people. The system is implemented using a web-based client–server architecture with a backend database for efficient data handling. Experimental results demonstrate that the chatbot provides accurate responses, improves user experience, and significantly reduces communication barriers in hospital environments.

23. AI HEALTH INTELLIGENCE COPILOT: A RETRIEVAL-AUGMENTED AND SENSOR-AWARE ASSISTANT FOR CONTINUOUS CARE, GUIDANCE, AND SAFE DECISION SUPPORT

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This paper presents a comprehensive blueprint for an AI Health Intelligence Copilot that unites retrieval-augmented generation (RAG) [15], [16] , medical large language models (LLMs), and continuous sensing [1] to provide cited, contextual, and safe guidance across home and clinical settings. The system fuses evidence retrieval with longitudinal health records and wearable telemetry, performs patient-specific anomaly detection, generates clinician-ready summaries, and offers transparent

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explanations aligned with responsible AI [17]–[19] principles and regulatory expectations [2], [5]. Grounding is enforced by hybrid retrieval and verifier checks [1], [4] to mitigate hallucinations, while interoperability through FHIR and consumer- led longitudinal health records preserves provenance, consent, and portability. Human factors drive engagement and adherence [3], ensuring recommendations are usable and trustworthy for diverse populations and use cases. A deployment and evaluation plan covers utility, safety, privacy, and equity [5], [6], translating research insights into a practical, scalable copilot.

24. MEDIXPLAIN: AN EXPLAINABLE AI FRAMEWORK FOR EVIDENCE-LINKED DIAGNOSTIC REPORTING FROM CHEST X-RAYS, RETINAL FUNDUS, AND BRAIN MRI

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Medical imaging is one of the well-known diagnostics tests employed in the diagnosis of the lung diseases, diabetic retinopathy, and brain tumors, which are time consuming and they necessitate skills of the experts to interpret the medical imaging appropriately. The one provided introduces MediXplain, a system of AI that is explainable, reserves the examination of the X-rays in the chest, scans of the retina, and scans of the brain with the help of MRIs and provides a structured report containing the diagnosis. It is an amalgamation of the engrossed profound learning forms and the visualization to represent the areas being eminent and one way of expressing the imprecision of foresight. Assessment is an experimental one with good performance and better interpretation. The system suggested will assist in streamlining the multi-modal diagnosis to become clearer and more persuasive that the clinicians will put their trust in the AI-based medical test. MediXplain is a broad jump in the direction

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of a multi-mode, AI-assisted clinical support decision, which will be a fine and reputable one in the general.

25. AI-ASSISTNAV – "AI-BASED VISUAL PERCEPTION AND NAVIGATION AID FOR THE VISUALLY IMPAIRED"

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Independent mobility remains a major challenge for individuality with visual impairments, especially when navigating strange surroundings. Traditional assistive tools similar as white nightsticks and companion tykes give introductory support, but they may not always descry obstacles at a distance or give detailed environmental information. Recent advancements in artificial intelligence and computer vision offer promising results for perfecting assistive technologies. This work proposes an AI grounded navigation backing system designed to support visually bloodied individuality by furnishing real- time information about their surroundings. The system captures visual data using a camera and processes the images through deep literacy models able of relating common obstacles similar as stairs, potholes, vehicles, and other walls. Once an object is detected, the system converts the information into spoken cautions using a textbook- to- speech module, allowing the stoner to admit immediate guidance. The proposed approach focuses on achieving dependable handicap discovery while maintaining effective real- time performance. By integrating computer vision ways with intelligent audio feedback, the system aims to enhance safety, mindfulness, and independence for visually bloodied druggies. The results demonstrate that similar AI driven assistive results have the eventuality to significantly ameliorate everyday navigation for people with visual disabilities.

26. HUMAN COGNITIVE ATROPHY: A DIGITAL BEHAVIOR-BASED ASSESSMENT AND ADAPTIVE COGNITIVE REINFORCEMENT SYSTEM

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The sudden development of artificial intelligence and digital applications has contributed to a high rate of cognitive offloading to a large degree where people rely on the usage of technology to engage in reasoning, memory prompts, and decision-making processes. The constant use of automated assistants may also slowly decrease the ability to think independently and in the process weaken a phenomenon known as cognitive atrophy. The current research is a proposal of Human Cognitive Atrophy Detection and Reinforcement System that aims to assess digital dependence and rehabilitate active thinking processes. The framework presents an Atrophy Risk Index (ARI) that uses the indices of behavioral patterns to assess the factors of response time, accuracy, rate of task completion, and performance consistency. The system gathers interaction information, assesses performance of cognition, provides challenging tasks that are adaptive and presents effort-oriented feedback to promote independent thinking. Experimental observations prove that structured activities of reinforcement can be useful to improve user interaction and reinforce the participation in problem-solving. The suggested framework leads to the cognitive sustainability as it offers correctional facility to monitor and strengthen the human ability to reason.

27. DERMVISION AI: A MULTIMODAL AI SYSTEM FOR FACIAL SKIN CONDITION DETECTION AND EXPLAINABLE INGREDIENT-AWARE SKINCARE RECOMMENDATION

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This study proposes a system named DermVision AI, which is a multimodal system aiming to provide personalized skincare recommendation services with the power of computer vision and ingredient-aware semantic analysis. The system uses a pre-trained model named EfficientNet-B3 to perform multi-label classification on facial images to identify multiple skin concerns simultaneously and provide a holistic view of facial characteristics. Additionally, the system uses a recommendation engine with the power of Sentence BERT to leverage a knowledge graph to map beneficial ingredients to the identified skin con- cerns. The system uses semantic similarity search with the FAISS algorithm and ingredient conflict filtering to prioritize products with scientifically validated active compounds to create a direct link between skincare diagnostics and treatment efficacy. The system demonstrates its potential to be an end-to-end pipeline for facial image analysis to recommendation services and provide a solution to integrate AI with dermatology-related applications on a large scale.

28. AI-ENHANCED IDENTIFICATION OF RICE LEAF NUTRIENT DEFICIENCIES THROUGH KNOWLEDGE, FEATURES AND DEEP REPRESENTATION

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In this paper, a machine learning model that utilizes multiple modes is introduced. system of nitrogen, phosphorus, and potassium detection deficiencies in rice plants through image analysis. The framework encompasses rule-based color evaluation, traditional machine learning, and deep learning (EfficientNetB0) models. Based on the dataset of 1,156 rice leaf images, the models attained respective classification accuracies of 71.91%, 86.20%, and 92. system provides a interpretable, efficient, and scalable solution to automated nutrient deficiency diagnosis in the greenhouse industry.

29. A MULTIMODAL VEHICLE ROUTING APPROACH FOR SMART URBAM LOGISTICS USING UNDERGROUND AND SURFACE NETWORK

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The rising demands of the last-mile delivery cause a great burden to the urban logistics systems as traffic congestion results in the growth of the operational costs and environmental pressure. The proposed paper presents a Vehicle Routing Problem with Hybrid Underground and Road-Based Transportation (VRP-HURT) model that incorporates Dynamic and large-scale optimization of logistics through Deep Q-Network (DQN)-based reinforcement learning. The DQN approach, in contrast to the classical tabular Q-learning, uses a deep neural network to provide approximations of optimal action-value functions, which make it efficient when dealing with high- dimensional state spaces. The framework amalgamates surface road networks with submarine transport choices with regards to traffic congestion, time windows of delivery, vehicle capacities and fuel consumption incorporated in the decision-making process. A pruning heuristic gets rid of suboptimal routing actions and this makes the computational process much more efficient and faster to converge. Because the simulation studies reveal that the proposed VRP-HURT framework can make considerably shorter delivery times, lower operational costs, fuel usage, and lower congestion in comparison to conventional and metaheuristic-based

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approaches, it can be concluded that the proposed framework can be scaled and be used in smart urban logistics planning.

30. AUTOMATED WEATHER OBSERVATORY SYSTEM FOR AIRPORT METEOROLOGY

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The proposed research work on an Automated Weather Observatory System for airport meteorological Application focuses on a design and implementation of an advanced, real time aviation meteorology support system aimed at enhancing pre landing safely, operational efficiency, and decision making in modern air traffic environments. The system is developed in alignment with the standard and recommended practices of the International civil aviation organization (ICAO) and the regulatory framework of the Director general of civil aviation (DGCA), integrating the operational guidelines of the India meteorological department (IMD). It incorporate a comprehensive data acquisition and processing architecture that utilizes multiple environmental sensors such as thermistor for temperature measurement anemometer for wind speed detection, ball switch mechanism for wind direction analysis, and infrared (IR) based transceivers for runway visibility and fog detection. The acquire Analog meteorological parameters-including surface wind characteristics, relative humidity, runway visual range (RVR) and atmospheric temperature are subjected to signal conditioning and filtration followed by conversion into digital signals using Analog to Digital convertors (ADCs) specifically employing successive approximation technique for high precision and real time compatibility. The processed data is further manipulated through embedded system involving Universal Synchronous/Asynchronous Receiver Transmitter (USART) protocol for serial communication, enabling efficient data logging graphical representation, threshold based warnings generation and control signal transmission to air traffic control (ATC) systems. The system supports the generation and dissemination of critical aviation meteorological reports such as METAR (Meteorological Aerodrome report), SPECI (Special Weather Report), and TAF (Terminal Aerodrome Forecast), along with hazard warnings like SIGMET (significant meteorological information) and wind shear alerts, thereby ensuring continuous weather monitoring and rapid communication across aeronautical meteorological offices (AMO). Furthermost the integration of communication technologies such as RS-232, RS-422, RS-485, and internet of things (IoT) based wireless modules facilitate seamless data transmission between runway subsystem and centralized control units over varying distances. The proposal system also emphasizes climatological analysis, automated observation, and predictive intelligence by leveraging real time meteorological datasets, therby contributing to improved flight safety, reducing human intervention and enhanced accuracy in weather forecasting during critical fight phases such as approach and landing. Overall this research presents a scalable , cost effective and technologically robust solution for next generation airport meteorological centers supporting the rapidly growing aviation sector with reliable and high resolution environmental intelligence.

31. AUTOMATED DETECTION OF CYBERBULLYING AND ONLINE HARASSMENT USING NLP TECHNIQUES

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Cyberbullying and online harassment have become major issues in how people communicate online, and there's a need for good systems that can detect these problems quickly and efficiently. Although there have been recent improvements in Natural Language Processing (NLP), especially with models based on transformers, most studies focus on how accurate these models are, without considering how they perform in terms of speed and resource use, which are important for real-time use. This study looks at five popular transformer models—BERT, RoBERTa, XLNet, DistilBERT, and GPT-2—and tests them using several social media datasets. The approach includes strong data preparation, understanding the meaning of words in context, and fine-tuning the models to better catch hidden, sarcastic, or context-based abusive content. The results show that BERT performs much better than the other models, with 95% accuracy, precision, recall, and F1-score.It also works quickly, taking just 0.053 seconds to process each item, uses less memory (35.28 MB), and consumes very little energy (0.000263 kWh). Unlike other studies, this research shows that being efficient is just as important as being accurate, especially when dealing with large amounts of content in real time. The study concludes that BERT is the best choice because it balances accuracy with efficiency. This research helps build better, faster, and more reliable systems for detecting cyberbullying online, and gives useful guidance for using NLP models in real-life social media situations.

32. A SMART GESTURE-DRIVEN BANKING INTERFACE ENHANCING COMMUNICATION FOR PHYSICALLY CHALLENGED CUSTOMERS

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The rapid development of digital banking applications has created a need to develop user-friendly, clean, safe and accessible user interface systems. Most traditional bank interfaces use keypad and touchscreen input methods, which lead to hygiene problems, access problems and can be physically hacked or broken into. In this paper we propose developing a Smart Banking Interface with gesture recognition by image processing in order to provide users with an interface that is touch-free, natural and safe to interact with the computer. Hand gestures will be used to represent numbers (0-9) and important banking functions. Frames from video cameras capturing the real-time gesture will be analysed using the OpenCV library and classified using deep learning algorithms such as Lightweight Hybrid Attention Vision Model (LHAVM), MobileNet V2. The LHAVM achieved 99.10% correct classifications while MobileNet V2 achieved 76.80%. Both results show a good tradeoff between accuracy and processing cost. Overall, our proposed system increases the accessibility, hygiene and safety of ATMs, Kiosks and Digital Banking Terminals.

33. SMART ASSISTIVE CHAIR

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A full body-scanning chair is an advanced medical device that utilizes infrared scanning technology to perform a comprehensive evaluation of a patient's body. The chair in this study incorporates an infrared scanner that activates as the internal temperature rises, conducting a detailed scan and transmitting the collected information to a healthcare professional or a personal trainer. When the temperature reaches one hundred degrees Celsius, the system issues a safety alert to the individual. The primary objective of the chair is to provide for conducting full-body anatomical characteristics such as body fat percentage assessments while delivering detailed insights into anatomical characteristics such as body fat percentage, mass, and other essential health indicators. These insights support more accurate health evaluations and help identify potential risks at an early stage. The chair is particularly beneficial for individuals who may be susceptible to conditions such as bone density deterioration or cardiovascular disease, as it enables early detection and timely clinical intervention. This research also emphasizes inclusive design by developing a model that accommodates individuals with disabilities, enhancing comfort, accessibility, and overall well- being through equitable access to advanced scanning technology.

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34. INVISIBLE ATTENDANCE SYSTEM USING WI-FI DETECTION

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The Invisible Attendance System is an automated attendance management solution designed to reduce manual effort and eliminate proxy attendance in educational institutions. Traditional attendance methods such as roll calls and sign-in sheets are time-consuming and prone to errors. The proposed system utilizes Wi-Fi network detection and mobile application technology to automatically mark student attendance when they connect to a predefined classroom network. The system consists of an Android application, Flask-based backend server, and MySQL database. The mobile application continuously monitors the Wi-Fi SSID and communicates securely with the backend server through REST APIs. Device binding ensures that attendance is recorded only from authorized mobile devices, enhancing system security. Attendance records are stored in the database for future analysis and reporting. Experimental results show that the proposed system provides accurate real-time attendance marking, reduces administrative workload, and improves overall efficiency. The system is scalable, cost- effective, and suitable for deployment in educational institutions seeking digital transformation.

35. A COMPREHENSIVE PYTHON-BASED FRAMEWORK FOR SECURE MONITORING AND DETECTION OF FRAUDULENT BITCOIN TRANSACTIONS ACROSS BLOCKCHAIN-DRIVEN CRYPTOCURRENCY ECOSYSTEMS

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With the rapid rise of cryptocurrencies, Bitcoin has become a leading digital payment platform known for its decentralized structure and pseudonymous transactions. However, this anonymity also attracts illicit activities such as money laundering, illegal trading, and financial scams, posing serious security

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risks. Detecting fraudulent Bitcoin transactions is therefore vital to maintaining the integrity and trust of digital financial systems. To address this, a machine learning–based detection framework is proposed to accurately classify transactions as legitimate or fraudulent using algorithms like Support Vector Machine (SVM), Naive Bayes, Random Forest, Decision Tree, and K-Nearest Neighbours (KNN). The system preprocesses data through normalization and feature scaling to enhance prediction accuracy and consistency across models. Each algorithm's performance is measured using metrics such as accuracy, precision, recall, F1-score, and the confusion matrix. Comparative evaluation reveals that the Random Forest model delivers the highest accuracy and reliability. Additionally, the system supports real-time transaction input and visual analytics, providing instant fraud detection results. This approach strengthens Bitcoin transaction security and demonstrates the potential of machine learning in mitigating fraud within decentralized cryptocurrency ecosystems.

36. CORNCRUZER: AN AUTONOMOUS IOT-ENABLED PRECISION SEEDING ROVER FOR CORN CULTIVATION

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The CornCruzer is a sophisticated, completely self- sufficient smart rover designed to monitor, explore, and navigate cornfields with little to no assistance from humans. Automation is becoming more and more necessary in modern agricultural settings to alleviate labor shortages, increase accuracy, and decrease operational inefficiencies. By combining reliable sensing, navigation, and communication technologies into a small rover platform that can operate dependably in the difficult terrain of cornfields, CornCruzer is designed to satisfy these needs. Its main goals are to help farmers obtain precise field insights, expedite regular monitoring duties, and improve decision-making by acquiring and analyzing data in real-time. A LiDAR module, which offers high-resolution spatial data for obstacle detection and environmental mapping, is the central component of CornCruzer's sensing system.Conventional cornfields pose a number of navigational difficulties, including close-packed crop rows, uneven terrain,

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and unforeseen obstructions like weeds, stones, or irrigation parts. The rover can identify obstacles, gauge their distance, and automatically plan avoidance maneuvers thanks to the LiDAR sensor's continuous distance measurements and point-cloud data. This guarantees safe navigation and avoids collisions that might harm the crop or the rover. CornCruzer uses infrared (IR) sensors positioned to sense the contrast between soil, plants, and field boundaries in order to maintain exact alignment within the crop rows.

37. A REAL TIME BEHAVIORAL AUTHENTICATION SYSTEM USING TYPING DYNAMICS FOR USER IDENTIFICATION

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Passwords and PINs are examples of traditional authentication methods that are frequently weak points in digital security. Systems are vulnerable because people frequently forget them, reuse them, or fall for phishing scams. A new strategy that employs real-time behavior rather than static credentials has been developed to get around this. The way users type on their keyboards is how the system recognizes them. The setup records minute patterns in typing, such as the duration of each key press, the interval between two keys, and the rhythm of keystrokes. It creates a distinct behavioral profile for each user using this data. After that, a machine learning model is trained to recognize these timing patterns and verify the user's identity while they type A front-end module that records keystrokes, a processing engine that extracts and cleans the data, and a classification model that determines whether the typing pattern corresponds to the actual user comprise the framework's three primary components. A lightweight Flask API makes everything run smoothly and keeps the system operating in real time. Tests demonstrate that this approach can consistently distinguish between real users and fraudsters. Additionally, it operates quickly enough to run continuously in the background without disturbing the user. Authentication is now easy and secure because to the system's smarter, more versatile, and less intrusive login process. Digital access control could benefit greatly from behavioral biometrics like these in the future.

38. MULTI-CLASS MACHINE FAILURE PREDICTION USING MACHINE LEARNING-DRIVEN GRADIENT BOOSTING IN INDUSTRIAL SYSTEMS

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Unplanned machine failures in industrial environments lead to production downtime, increased maintenance costs, and safety risks. Predictive maintenance aims to address these challenges by identifying failure patterns in advance using operational and sensor data. This paper presents an XGBoost-based predictive maintenance framework for accurate machine failure prediction and fault type classification. The proposed system utilizes machine operational parameters such as temperature, rotational speed, torque, and tool wear to detect potential failures and categorize them into specific fault types. A structured data preprocessing pipeline is implemented to ensure consistency between training and inference, including feature encoding and normalization. The model is evaluated using standard performance metrics such as accuracy, precision, recall, and F1-score, demonstrating improved predictive performance compared to baseline machine learning approaches. The proposed framework offers a reliable and deployment-ready solution for industrial machine failure prediction, supporting proactive maintenance decisions and reduced operational downtime.

39. AI-BASED GENETIC RISK PREDICTION USING PHARMACOGENOMICS

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Genetic risk prediction is an important feature of personalized treatment; however, a significant number of current approaches rely on complex models and large genomic datasets. This leaves potential for simple and light solutions that can demonstrate how to quantify genetic risk in a way that can be relevant and easy to understand. This article discusses an AI-driven genetic risk prediction system, which uses a supervised machine learning system to group data relating to an SNP based on the likelihood of an individual developing a disease. The proposed system comprises a Flask-based backend, a web-based React frontend, and a trained machine learning classifier. This allows users to enter inputs of genetic markers so that the machine can predict the dangers in real time. The main goals of the system are to be easy to use and tset up, even while being able to make accurate predictions. A strong foundation was built for future research for genetic assessment and precision medicine using machine learning.

40. GENETIC RISK PREDICTION USING AI-DRIVEN PHARMACOGENOMICS

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The fast development of genomic technologies has provided novel possibilities of enhancing the prediction of diseases and personal health care. The project introduces a genetic risk predictor system, which uses the latest deep learning methods to process genomic data and determine its possible disease proneness. The suggested system works with genomic data presented in the form of Variant Call Format (VCF) files and reveals valuable genetic variations, including Single Nucleotide Polymorphisms (SNPs), which can contribute greatly to defining whether a person is at risk of developing a particular disease. The system can detect the intricate patterns in the genetic data using machine learning and deep learning models and come up with precise risk predictions. The framework uses effective deep learning architectures, such as the Vision Transformers (ViT) and Convolutional Neural Networks (CNNs), to improve the level of predictive capability at low computational costs. These models undergo training on massive genomic data to be taught how genetic variations are related to the disease outcome. It has been developed to conduct real-time genomic analysis, which allows identifying genetic risk factors quickly and taking medical action. In order to enhance interpretability and trust in predictions, the system combines explainable methods of artificial intelligence that show the role of particular genetic variations in the predicted results. The architecture is also planned to be integrated with the various sources of healthcare data including electronic health records and wearable health devices, so as to support more accurate and complete risk assessments. The suggested system has a high predictive accuracy, and it is scalable and efficient with real-world healthcare systems. The system can help with the development of precision medicine by combining artificial intelligence and genomic analysis to help identify diseases early, plan individual treatment, and actively manage the health of individuals.

41. A MULTI-AGENT IOT FRAMEWORK FOR REAL-TIME EPILEPTIC SEIZURE PREDICTION USING HYBRID EEG-ECG DEEP LEARNING MODELS

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Globally, around 65 million individuals experience epilepsy, facing unpredictable seizures that result in considerable health hazards. Although pharmacological interventions prove beneficial for numerous patients, approximately one-third experience medication-resistant epilepsy, demanding innovative therapeutic alternatives. This research introduces an innovative multi-agent IoT architecture designed for real-time epileptic seizure forecasting through hybrid deep learning frameworks utilizing both EEG and ECG biosignals. The proposed solution implements a 1D-CNN framework incorporating Focal Loss optimization to address dataset imbalance, while deploying a distributed agent-based structure for parallel prediction processing, automated report synthesis, emergency notification systems, and intelligent information retrieval. Brain activity measurements from the CHB-MIT repository and cardiac recordings from wearable technology undergo independent classification procedures, subsequently merged through late fusion methodologies to enable reliable seizure forecasting approximately sixty minutes ahead of onset. The architecture combines PostgreSQL for organized data management and ChromaDB vector storage integrated with Retrieval Augmented Generation capabilities for contextually-aware conversational responses. Validation experiments reveal outstanding efficacy exceeding 99% across accuracy, sensitivity, and specificity dimensions, substantially surpassing conventional single-signal methodologies while preserving minimal false alarm frequencies of 0.23 per hour.

42. CAMERA BASED SYSTEM TO IMPROVE AMBULANCE TRANSPORTATION IN URBAN AREAS

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In a lot of cities, traffic jams make it hard for ambulances to get to the scene of an emergency quickly. It very important to get to the patient or hospital on time, and even small delays at traffic lights can have big effects on lives. This paper describes a camera-based system that is meant to help ambulances move more quickly in cities. The system uses computer vision techniques to find ambulances and keep an eye on road conditions at all times with traffic cameras. Before making a final decision, other factors, like siren detection, are taken into account to make the system more reliable. When an ambulance is detected, the traffic light automatically turns green in its direction, letting it go without stopping. At the same time, other cars are stopped for a short time to make sure the path is clear.The system also looks at traffic conditions at intersections in real time to keep traffic from getting too heavy. The results show that this method cuts down on the time it takes for ambulances to get to their destinations and speeds up their overall travel.

43. PHYSICS-AWARE MULTI-FRAME AND MULTI- BAND SUPER-RESOLUTION FRAMEWORK FOR CONSUMER-GRADE TELESCOPES

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Small apertures, atmospheric turbulence, optical aberrations, sensor noise, and unstable mounts are fundamental limitations of consumer-grade telescopes that reduce the spatial fidelity of captured astronomical imagery. This paper suggests a unified Physics-Aware Multi-Frame and Multi-Band Super- Resolution framework that can reconstruct high-resolution, physically consistent observations from low-quality burst sequences in order to overcome these limitations. To take advantage of both spatial and wavelength-dependent correlations between the frames, the system integrates spectral attention mechanisms, temporal feature fusion, and deformable multi-frame alignment.. The reconstructed outputs follow optical imaging laws and do not introduce hallucinated details as a result of physics- guided loss formulation that incorporates PSF-aware forward consistency, flux preservation, and structure-constrained regularization. A hybrid dataset that includes real telescope videos to facilitate domain adaptation and artificial HR→LR pairs produced by turbulence and noise simulations is used for training. Significant gains in PSNR, SSIM, and perceptual metrics over current single-frame and video SR baselines are shown by experimental results across lunar, planetary, and deep-sky datasets. Additionally, near real-time inference is achieved by an optimized TensorRT deployment, allowing for improved live- view augmentation for amateur telescopes. These findings demonstrate how physics-informed deep learning can greatly improve the performance of inexpensive astronomical imaging systems.

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44. CAUSALLY INVARIANT SPATIOTEMPORAL REPRESENTATION LEARNING FOR ROBUST OUT-OF-DISTRIBUTION INTELLIGENT TRANSPORTATION SYSTEMS

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ITS systems are known to live in very dynamic and heterogeneous environments where the data distributions continuously change leading to out-of-distribution situations where traditional learning models degenerate. In this study, we suggest a causal representation architecture that aims at learning robust generalization through structural patterns, which are invariant to markers in spatiotemporal traffic data with the purpose of learning generalization. The framework combines four new algorithms, including Spatio-temporal Causal Decomposition, which isolates latent interaction mechanisms, Counterfactual Flow Propagation, which simulates unseen traffic interventions, Invariant Latent Alignment, which maintains causal consistency, and Adaptive Perturbation Regularization, which suppresses spurious correlations in training. The proposed approach outperforms existing methods on predictive stability, performance variability, and higher robustness when it comes to non- stationary conditions and is implemented and assessed with the help of multi-modal traffic datasets. The findings validate the idea that the ability to apply causal reasoning to representation learning facilitates more interpretative, resistant, and adaptive traffic intelligence. This framework gives a baseline step into context-sensitive autonomous traffic management that can make proactive decisions addressing the complicated transportation ecosystem in urban settings.

45. ARTIFICIAL INTELLIGENCE ASSISTED TELEMEDICINE FOR RURAL INDIA

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This telemedicine platform provides the means for patients in rural and under served communities to access care from their own homes via AI-driven end to end digital consultation system. Using a virtual assistant in the form of an intelligent chatbot patients can describe their symptoms in conversational language and the chatbot will use Google Gemini AI to parse through that input to identify their medical symptoms. The chatbot's extraction of symptoms then feeds into machine learning algorithms that will utilize Random Forest classifier to predict the disease likely causing the symptoms and use Logistic Regression to assess the risk of heart disease based on the patient's vital health parameters. Depending on how severe the predicted disease is the system may either provide automated medical advice for non serious conditions or connect the patient with an available doctor to allow for further consultation and appointment scheduling as well as the generation of e- prescriptions for medications. The ML component of the platform is developed as Flask based microservices and have secure JWT authentication. The entire platform is constructed using a scalable MERN stack.

46. INTELLIGENT ENERGY TILES FOR SMART CITIES

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The demand of sustainable energy has increased especially in the urban centres in the recent days. The following paper will introduce the processes of constructing and testing a power generating piezoelectric tile which converts the kinetic energy of the footsteps into the electricity which is usable. This tile is meant to use in the locations where pedestrians are often in large numbers, with piezoelectric sensors that can capture the mechanical pressure energy that is converted into electricity and an Arduino Nano microcontroller is used, where it undergoes more processing. An LCD represents the reality of the energy produced in real time and the LED strips are used to have immediate visual feedback. The system assists smart infrastructure in achieving its objectives, advocacy of environmental sustainability, efficient use of renewable energy and conforms to the Sustainable Development Goals.

47. IOT-BASED WILD ANIMAL DETECTION AND ALERT SYSTEM FOR TRIBAL SAFETY

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Human–wildlife conflict is an increasingly serious issue in many regions, leading to loss of crops, property damage, and threats to both humans and animals. To mitigate this problem, this paper presents an IoT-based Wild Animal Detection and Alert System using Artificial Intelligence (AI), designed to provide real-time detection and early warning of wild animal intrusions. The proposed system employs an AI- enabled camera module interfaced with an Arduino UNO for efficient image capture, classification, and alert transmission. The camera continuously monitors the surrounding environment and captures images, which are analyzed using a pre-trained deep learning model capable of recognizing different species of wild animals Upon detection of a wild animal, the system automatically sends an instant alert message or notification to nearby residents or forest officials through an IoT network, using either Wi-Fi or GSM connectivity.

48. JARVIS: JUST A RATHER VERY INTELLIGENT SYSTEM

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The advancement of artificial intelligence has enabled the creation of intelligent personal assistants capable of performing complex, multimodal tasks. Traditional voice assistants, however, remain limited by fixed functionalities, restricted automation, and lack of meaningful integration across conversational AI, web search, image generation, and system- level control. To address these limitations, this project presents JARVIS AI, a Python-based, fully integrated personal assistant inspired by the conceptual architecture of Iron Man's JARVIS. The system leverages a combination of voice recognition, natural language processing, real-time web search, task automation, and generative AI to deliver a unified interactive experience. JARVIS AI incorporates a PyQt5 graphical interface and employs advanced AI models—Cohere for decision-making, Groq for conversational synthesis, and Stable Diffusion for high-quality image generation. It intelligently categorizes user queries into general, real-time, automation, system commands, or image generation tasks, enabling seamless execution of actions such as opening applications, performing web searches, generating images, and providing contextual conversational responses. The pipeline integrates browser-based speech recognition, TTS synthesis, persistent chat logging, and a modular backend architecture that ensures scalability and robustness. Experimental results demonstrate rapid task execution, high conversational coherence, and efficient multimodal processing across diverse user requests. JARVIS AI showcases the potential of Python-based AI ecosystems to serve as comprehensive personal assistants capable of real-time interaction, automation, and AI-driven decision-making.

49. DECOY-NET: INTEGRATED DECEPTION- BASED INTRUSION DETECTION WITH ALERTING AND ATTACK CLASSIFICATION

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DECOY-NET is a deception-based intrusion detection and attack classification framework designed to strengthen cybersecurity through proactive threat engagement. The system deploys honeypots and decoy network services to attract and analyze malicious actors, capturing detailed behavioral and network interaction logs. These logs are processed and classified using machine-learning techniques to identify attack types such as brute-force, port scans, and exploit attempts. DECOY-NET integrates real-time alerting through Email and Telegram to ensure rapid incident response, while a Flask-based dashboard provides comprehensive visualization of attack trends, geolocation insights, and system activity. Experimental evaluation demonstrates improved detection accuracy, enhanced attacker profiling, and faster response mechanisms compared to traditional IDS models. The modular architecture also ensures adaptability for future expansion, making DECOY-NET a practical and scalable solution for modern cybersecurity environments.

50. SMART ONLINE EXAMINATION PLATFORM WITH AUTO-GRADING AND AI- DRIVEN LEARNING ANALYTICS

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The increasing adoption of online education has highlighted the need for examination systems that provide not only automated assessment but also meaningful academic insights. This paper presents an Online Examination System with Auto-Grading and Predictive Analytics for Student Performance, developed to enhance the efficiency and effectiveness of academic evaluation. The proposed web-based system automates the process of conducting examinations and grading student responses for objective and short-answer questions. It further analyses historical and current examination data to predict future academic performance, identify learning gaps, and detect students who may require additional academic support. Based on the predicted outcomes, the system provides personalized learning path recommendations to support continuous improvement. An AI-based chatbot offers academic guidance and performance clarification, while interactive dashboards and downloadable performance reports assist both students and faculty in monitoring progress. The proposed system reduces manual evaluation effort, improves assessment accuracy, and enables data-driven academic decision-making, making it suitable for modern educational institutions seeking scalable and intelligent online assessment solutions.

51. A BROWSER-INTEGRATED CNN–TRANSFORMER MULTIMODAL FUSION FRAMEWORK FOR REAL-TIME CONTEXTUAL SOCIAL MEDIA NARRATION FOR BLIND USERS

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Social media sites have become very pictorial and multimedia communication environments which pose accessibility problems to blind and visually impaired individuals. Traditional screen readers either use text only or alternative text alone, with no description of images, embedded text, hashtags, and contextual relationships. In this paper, a CNN-Transformer multimodal fusion framework that is embedded in a browser is proposed and intended to be used in real-time social media narration. The structure derives post images, captions, hashtags and metadata to create a structured multimodal expression. A Convolutional neural Network (CNN) is used to process images and provide a set of descriptive captions, whereas Optical Character Recognition (OCR) identifies textual contents hidden in the images. Attention mechanisms inspired by transformers are then used to semantically combine textual and visual modalities to generate coherent and contextually correct narrations. The resultant output is brought out on a neural Text-to-Speech engine that has low-latency output and allows easy real-time interaction with the user. This framework focuses on the completeness of context, semantic correspondence, and real- time provision unlike the current captioning or alt-text methods. It is experimentally evaluated to have descriptive richness, accuracy, and overall accessibility improvements and is therefore a promise as a platform-independent, scalable solution to inclusive social media engagement.

52. SENTIMENTAL ANALYSIS FOR THE ONLINE FORUM TO FIND THE CRIMINAL ACTIVITY

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Online forums have become prominent platforms for open discussion, information sharing, and community interaction. However, these platforms are also increasingly exploited for organizing, promoting, or normalizing criminal activities. This research proposes a sentiment analysis–driven framework to analyze online forum content with the objective of identifying potential criminal intent and suspicious behavioral patterns. The proposed approach combines text preprocessing, sentiment polarity detection, emotion classification, and contextual risk assessment to distinguish harmful discussions from benign interactions. By analyzing emotional cues such as aggression, hostility, fear, and persuasion, the system aims to uncover implicit signals associated with criminal planning or endorsement. Experimental evaluations conducted on forum-based textual datasets demonstrate that sentiment-aware analysis enhances the detection of high-risk content compared to keyword-based methods. The findings highlight the potential of sentiment analysis as an effective tool for supporting digital forensics, online moderation, and proactive crime prevention strategies.

53. ENHANCING VIDEO-BASED OBJECT DETECTION THROUGH YOLOV8 AND LSTM INTEGRATION

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Object detection in dynamic environments requires not only accurate spatial feature extraction but also effective modeling of temporal information. While YOLOv8 provides state-of-the-art real-time object detection through its efficient convolutional architecture, it operates primarily on individual frames and

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lacks temporal awareness. This study proposes a hybrid object detection framework that integrates YOLOv8 with a Long Short-Term Memory (LSTM) network to enhance detection performance in video sequences. YOLOv8 is employed to extract spatial features and preliminary object predictions from each frame, which are then passed to an LSTM module to capture temporal dependencies across consecutive frames. The LSTM enables the model to learn motion patterns and contextual continuity, leading to improved detection stability and reduced false positives in dynamic scenes. Experimental results demonstrate that the proposed YOLOv8–LSTM approach outperforms frame-based detection models in terms of accuracy and temporal consistency, particularly in scenarios involving occlusion, motion blur, and rapid object movement. This hybrid architecture shows strong potential for real-time video-based applications such as surveillance, autonomous driving, and activity monitoring

54. AN INTEGRATED BILSTM AND GAN MODEL FOR CONTEXT-AWARE OBJECT DETECTION IN IMAGE DATA

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Object detection in static images remains a challenging task due to variations in object scale, background complexity, and contextual ambiguity. Although deep convolutional neural networks have achieved remarkable success in spatial feature extraction, many existing models rely solely on local visual cues and often fail to capture broader contextual relationships within an image. To address these limitations, this study proposes an integrated object detection framework that combines Bidirectional Long Short-Term Memory (BiLSTM) networks with Generative Adversarial Networks (GANs) to enhance context awareness and detection robustness. In the proposed model, a convolutional backbone is first employed to extract discriminative spatial features from input images. These features are then processed using a BiLSTM network to model contextual dependencies in multiple directions, enabling a richer representation of object-to-object and object-to-scene relationships. Additionally, a GAN-based module is incorporated to refine feature representations through adversarial learning, improving the detector's ability to handle challenging visual conditions such as cluttered backgrounds and low-contrast objects. Experimental evaluation using standard object detection

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metrics demonstrates that the proposed approach achieves improved precision, recall, and mean average precision compared to conventional CNN-based detection models. The results indicate that integrating BiLSTM-based contextual modeling with GAN-driven feature enhancement provides a promising direction for accurate and context-aware object detection in image data.

55. ADAPTIVE PERSONALIZED AI TUTOR FOR INTELLIGENT LEARNING USING MULTI-AGENT MACHINE LEARNING AND PERFORMANCE MODELING

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Traditional learning systems often follow a uniform teaching approach, which does not address the individual needs of every student. This project presents an AI-based Personalized Tutor System designed to adapt educational content according to each learner's performance and learning pace. The system analyzes various student metrics, including assessment scores, response time, accuracy, and progress patterns, to understand their learning level. By applying machine learning techniques, the system categorizes students into different proficiency levels and dynamically adjusts the difficulty and style of instruction. A multi-agent framework is used, where separate intelligent modules manage data collection, performance analysis, content recommendation, and feedback generation. This collaborative structure enables the system to respond intelligently to each student's strengths and weaknesses. When a learner struggles with a topic, the system provides simplified explanations, guided problem- solving steps, and additional practice materials. For students who demonstrate strong understanding, it introduces more advanced concepts to encourage deeper learning. Through continuous monitoring and adaptive content delivery, the system promotes personalized learning, improves engagement, and enhances overall academic performance This AI-driven tutoring model aims to create a flexible and student-centered educational environment that supports effective and meaningful learning experiences.

56. DRAS: INTEGRATED EMERGENCY RESOURCE DISTRIBUTION DURING DISASTER AND CRISIS TRACKING

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In order to minimize fatalities, lessen suffering, and safeguard vital infrastructure, disasters—whether man-made or natural—require quick, coordinated, and effective resource allocation. Due to delayed information, disjointed communication, and reactive decision-making, traditional disaster response mechanisms frequently result in inefficient resource distribution and heightened vulnerability during crucial windows. This paper introduces the Disaster Resource Allocation System (DRAS), an integrated AI-powered platform designed to change emergency management from a reactive to a proactive and predictive paradigm in order to address these systemic issues. The fundamental innovation of DRAS is its comprehensive architecture, which combines a centralized SOS command center, live operational dashboards, predictive analytics, and regional geospatial analysis into a single pane of glass for crisis coordination. The DRAS platform synthesizes multi-modal input parameters, such as disaster type, geographic region, real-time meteorological data, and affected population metrics, using sophisticated machine learning models, such as ensemble methods and neural networks, to dynamically assess disaster severity. By taking into account regional factors like population density, infrastructure resilience, and logistical constraints, this predictive intelligence powers an intelligent allocation engine that dynamically aligns available resource inventories—such as food, water, medical kits, and shelter—with projected requirements. Additionally, as a crisis develops, the system's real-time monitoring dashboard gives emergency commanders unparalleled visibility into resource deployment, live deficits or surpluses, and field team status. This allows for ongoing operational adjustment and strategic resource repositioning. DRAS provides notable, quantifiable improvements over traditional systems, as demonstrated by experimental evaluations and simulations using historical disaster data from several regions. Reducing the average emergency response time by more than 30%, increasing the efficiency of resource allocation to 82%, and improving coverage accuracy to more than 89% are examples of key performance metrics. The system can integrate with current government databases, IoT sensor networks, and third-party logistics platform because it was built with scalability and interoperability as fundamental design principles. Global emergency management agencies, non-governmental organizations, and civic authorities can improve preparedness, expedite response, and ultimately create more resilient communities in the face of increasing disaster risks with DRAS's scalable, flexible, and data-driven framework.

57. “DIGITAL RECYCLING MARKETPLACE”

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The amount of recyclable waste has greatly risen due to swift urbanization and increased consumption, creating major challenges for effective waste management. Conventional businesses often show a lack of transparency, are chaotic, and offer unreliable prices from poor vendors. This paper proposes a digital recycling marketplace established on a centralized platform managed by administrators to circumvent these limitations. Sellers use an online platform to submit details about recyclable waste, such as type, weight, images, and collection site. The administrator verifies the waste's quality, establishes prices based on set standards, and supplies buyers with a list of approved waste. Approved waste can be acquired by purchasers, and smooth processes are guaranteed through pickup planning and status monitoring. Along with boosting transparency, the approach reduces manual effort. Digital records and secure verification enhance monitoring and responsibility. Overall, the strategy promotes environmentally-conscious waste management and awareness.

58. DETECTION OF RECRUITMENT FRAUD USING HYBRID TEXT INTELLIGENCE AND TRUST SCORING

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Online recruitment platforms have become an essential medium for employment opportunities; however, their widespread adoption has also led to a rapid increase in fraudulent job postings. These deceptive advertisements are designed to mislead job seekers, resulting in financial loss, identity theft, and reduced trust in online hiring systems. Traditional detection approaches mainly rely on manual verification or rule-based mechanisms, which are time- consuming, error-prone, and ineffective against evolving fraud patterns. To address these limitations, this paper proposes an automated machine learning-based framework for detecting fake job postings using Natural Language Processing techniques. The proposed system performs text preprocessing and feature extraction through advanced vectorization methods to capture semantic and contextual information from job descriptions. Multiple classification models are trained and evaluated to effectively distinguish fraudulent postings from legitimate ones. Furthermore, class imbalance issues inherent in recruitment datasets are mitigated using appropriate resampling techniques to enhance detection accuracy and model robustness. Experimental results demonstrate that the proposed approach significantly improves fraud detection performance and contributes to building a safer and more trustworthy online recruitment environment.

59. BESSTIE: A MULTITASK DEEP LEARNING FRAMEWORK FOR SENTIMENT AND SARCASM DETECTION IN ENGLISH AND HINGLISH TEXT

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Another important activity in Natural Language Processing (NLP) is sentiment analysis and sarcasm, which interprets the online reviews and social media opinions. However, sarcasm cannot be detected easily, as one is likely to use words with good connotation when saying something negative. This is even more challenging in a multilingual background such as India where users usually write comments in a combination of English and Hindi or also referred to as Hinglish. The author proposes in this paper a multitask deep learning model, BESSTIE (BERT Enhanced Sentiment and Sarcasm Text Intelligence Engine), a model applied to perform two functions- sentiment classification and sarcasm detection. The BERT model of the proposed system is transformer-based and has a shared encoder and two classification layers. With such an architecture, the model is allowed to obtain an intuitive text meaning and approximate sentiment (good or bad) and sarcasm (sarcastic or not sarcastic) on the same input sentence. The training model is offered on an equal representation of English and Hinglish commentary on the basis of online reviews and social media posts. Standard preprocessing procedures such as text cleaning, tokenization and normalization are the precursors of training. PyTorch and Hugging Face Transformers are applied to implement the system using Python. The experimental results show that the proposed multitask model is appropriate in the two tasks. In the validation data, the system produced a sentiment classification of 90.99 and a 89.07 sarcasm detection. A web based application was designed too so that the end user could either disaggregate each sentence individually or can also insert a few comments in order to anticipate the output and see it in real time. The research project demonstrates that multitask learning can improve the attitude of complex user perception in mixed language interface and can be applied in review analysis, social media monitoring and customer response systems.

60. THE REAL-TIME FACE ANTI-SPOOFING USING VISION TRANSFORMER

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This project is aimed at creating a smart face authentication system using deep learning methods to effectively detect cases of spoofing. The traditional methods of facial recognition are inadequate as they cannot be applied in the real world security context since they are susceptible to attacks by use of printed images, video playbacks, and 3D masks. To address this challenge, the present project proposes a model, which is designed on Vision Transformers (ViT), trained with the framework of DINO. This improves the ability of the system to extract significant facial information without the need to have labelled data. This approach relies on attention-based processes, which facilitate the model to identify genuine and counterfeit faces with respect to paying attention to subtle details in the facial photographs. The system also has the ability to detect faces in real time and preprocesses and extraction of key features on faces.

61. PASSPHRASE–DRIVEN AES-GCM STEGANOGRAPHY FOR SECURE IMAGE–BASED MESSAGE TRANSMISSION

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The rapid growth of digital communication has increased the risk of unauthorized data access and information leakage. Traditional cryptographic techniques secure message content but often expose the existence of communication. This paper presents a secure image steganography framework that integrates Advanced Encryption Standard (AES) encryption with Least Significant Bit (LSB) data hiding to achieve confidentiality and invisibility. In the proposed system, the sender encrypts a secret message using an AES key derived from a user-defined passphrase and a randomly generated salt. The resulting cipher text, along with the nonce and authentication tag, is converted into a binary payload and embedded into the LSBs of a cover image. At the receiver end, the payload is extracted and decrypted using the same passphrase. Experimental results demonstrate effective prevention of unauthorized decoding while maintaining high visual quality of the stego image.

62. SKILLHUB: A WEB-BASED PEER-TO-PEER SKILL EXCHANGE PLATFORM WITH IDENTITY VERIFICATION, COMPLEMENTARY MATCHING, AND SESSION TRACKING

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Paid courses and institutional fees shut out a large number of people who want to learn new skills. SkillHub is a web application built to change that by letting users swap what they know instead of paying for instruction. The system is built on three layers: a JavaScript front end, a Node.js/Express.js back end, and a MongoDB Atlas database. New users upload government ID documents. An admin reviews and approves each account before it goes live. Verified users search for matches, send session requests, fix a time to meet, and message each other in real time through Socket.IO. A small pilot with twelve users confirmed that all parts of the system work together without issues. This paper explains the design choices, describes each module, gives the matching formula, and shares what the pilot told us.

63. FOREST FIRE BURNED-AREA PREDICTION: A COMPARATIVE ANALYSIS OF SVM, RANDOM FOREST, DECISION TREE AND NEURAL NETWORK MODELS

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Accurate estimation of burned area is essential in the management of forest fires, especially in the occurrence of large uncontrollable forest fires. It helps in providing better response by the disaster management divisions of the area. In this paper, we present a comprehensive comparison of various papers which have described how to predict the affected area of forest fires by using various algorithms like Support Vector Machines (SVM), Random Forests (RF), Decision Trees (DT), and Neural Networks (including Multilayer Perceptrons) and using various datasets like the UCI Machine Learning Repository (Montesinho Natural Park, Portugal), Kaggle-sourced historical fire records, and multi-modal satellite imagery. The models are evaluated using metrics like accuracy, precision, recall and F1-score, R 2 , MSE, RMSE. The paper explains different datasets taken by different papers and their effect on the algorithms and results obtained. With our findings, we identify that while no single model dominates all scenarios, ensemble methods and kernel- based approaches consistently outperform individual baseline models by capturing complex non-linear relationships. The results show that Random Forest often yields the highest R 2 values (up to 0.996) and lowest RMSE when integrated with terrain and forest stand factors, whereas SVM with an RBF kernel demonstrates superior performance in predicting the burned area of frequent small fires, achieving a Mean Absolute Error (MAE) as low as 12.71. This research demonstrates the transformative potential of machine learning in overcoming the extreme skewness of fire- weather data, proving that automated predictive intelligence can significantly enhance real-time decision-making and long-term ecological resilience.

64. XAI DEEP LEARNING FRAMEWORK FOR INTELLIGENT NETWORK INTRUSION DETECTION

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Effective network traffic monitoring is essential for ensuring secure communication, minimizing cyber threats, and maintaining uninterrupted service availability in large-scale infrastructures. Traditional network monitoring systems often fall short due to limited scalability, high latency, and the absence of real-time analytics and explainability, resulting in delayed threat detection and inefficient network management. This paper proposes an AI- powered real-time network flow monitoring and intrusion detection framework that integrates Apache Kafka with advanced machine learning and Explainable AI (XAI) techniques to achieve scalable, transparent, and intelligent network analysis. The architecture is composed of multiple layers, including Data Capture, Kafka Producer–Broker– Consumer, Data Processing, Machine Learning, Output, and Visualization, working together in a seamless data pipeline. Network packets are captured using TShark, extracting critical flow parameters such as IP addresses, ports, and protocols. The captured data is transmitted through Kafka's distributed streaming platform to enable low-latency and fault-tolerant message handling. Preprocessed flow data is analyzed using a hybrid deep learning model combining Generative Adversarial Networks (GAN), Temporal Graph Networks (TGN), and Gated Recurrent Units (GRU) to detect anomalies and classify network behavior as benign or malicious. The integration of XAI components enhances interpretability, providing security analysts with clear justifications behind predictions. Real-time dashboards visualize traffic statistics, anomaly alerts, and model outputs, enabling proactive decision-making and improved situational

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awareness. This framework offers a scalable, explainable, and efficient solution for modern network security analytics, significantly improving threat mitigation and operational resilience in dynamic and data-intensive environments.

65. AGROMIND - "MULTI-MODULE AGRICULTURE SYSTEM: DISEASE PREDICTION, FERTILIZER OPTIMIZATION, SCHEME DISCOVERY, WEATHER ANALYTICS & CHAT AI"

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AgroMind – Multi-Module Agricultural System: Disease Prediction, Fertilizer Optimization, Scheme Discovery, Weather Analytics & Chat AI" – This is also a farm management system based on AI that can greatly help farmers with the ability to make intelligent and data-driven decisions. This system comprises different components such as disease prediction for crops, fertilizer optimizers, weather analyzers, and government schemes. The use of AI-based vision technology of crop disease prediction by AgroMind will allow farmers to identify crop diseases using images as well as symptoms of the crops, which can ultimately help reduce crop losses as well as improve crop quality. It also uses hyperlocal weather information, soil-specific fertilizer suggestions, and AI-assisted chatbots which provide specific agricultural advice based on contexts. A centralized console provides information on crop conditions, schedules, expenses, and estimates of production. Being farmer-friendly and designed for offline usage in areas with less internet connectivity, the tool is quite effective in facilitating

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sustainable and precision agriculture by optimizing resources, improving production, and recommending innovative online agriculture techniques.

66. DESIGN AND IMPLEMENTATION OF AN AUGMENTED REALITY PLATFORM FOR HISTORIC EVENTS

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In the past, history classrooms have taught pupils about historical events using textbooks, still images, and recorded videos. These methods effectively communicate factual knowledge, but they often impair students' ability to visualize historical contexts and emotionally connect to the significance of events. Lack of spatial immersion and involvement can hinder deeper understanding of complicated historical circumstances and lower student engagement. Immersion visualization is now possible through normal web browsers thanks to recent developments in web technologies, providing real-time 3D rendering and extended reality (XR) without the need for native apps or specific hardware. Consequently, Web-Based Augmented Reality (Web AR) has become a promising instrument for improving history instruction. This study introduces a Web-Based Augmented Reality system that uses interactive three-dimensional environments combined with an intelligent chatbot to recreate and visualize significant historical events. The chatbot serves as a virtual guide by offering contextual explanations, responding to user inquiries, and facilitating interactive learning in real time while the technology submerges users in a 360-degree augmented reality environment where they can freely explore rebuilt historical situations. The suggested method concentrates on browser-based immersive visualization, guaranteeing consistent user experiences across devices and locales, in contrast to conventional augmented reality systems that rely on camerabased tracking, physical markers, or real-world alignment. The system improves user engagement, accessibility, and comprehension of historical events by fusing conversational interaction with immersive augmented reality representation. This makes it a useful tool for immersive history education and digital heritage visualization. To further increase user engagement and learning effectiveness, the proposed system incorporates an intelligent chatbot module that enables conversational interaction within the Web-Based Augmented Reality environment. The chatbot functions as a virtual historical assistant, allowing viewers to ask questions concerning the persons,

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events, time periods, and artifacts depicted in the augmented scenes. By providing quick, context-aware answers, the chatbot promotes self-directed inquiry and reduces the need for static textual descriptions. Its seamless interaction with the browser-based augmented reality interface allows for personalized learning and ensures ongoing immersion.

67. RESUSMART-AI-POWERED RESUME ANALYZER AND CAREER RECOMMENDER

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The rapid growth of online recruitment platforms has significantly increased the volume of resumes processed by organizations. Applicant Tracking Systems (ATS)are widely used to automate resume screening; however, most existing systems rely on keyword-based matching techniques that fail to capture semantic relationships between candidate skills and job requirements. This limitation often results in inaccurate job recommendations and limited career guidance. This paper proposes an NLP-based skill gap aware job recommendation framework that integrates semantic resume analysis, similarity based job ranking, explicit skill gap identification, and structured learning roadmap generation. Resumes and job descriptions are processed using a unified natural language processing pipeline and represented in a shared vector space. Cosine similarity is employed to rank relevant job roles, while a skill gap module identifies missing competencies and generates personalized up skilling guidance.Experimental evaluation conducted on publicly available resume and job description datasets demonstrates that the proposed framework significantly outperforms conventional keyword- based approaches in terms of precision, recall, F1- score, and top-K recommendation accuracy.

68. A DEEP TRANSFER LEARNING FRAMEWORK FOR NON- INVASIVE BLOOD GROUP IDENTIFICATION USING FINGERPRINT BIOMETRICS

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The identification of the blood group is important in the clinical diagnostics, the emergency medical care, and the transfusion management. Traditional blood grouping methods are mainly intrusive, involving the extraction of blood samples and serological analysis in the laboratory, which cannot be done in resource-constrained or where time is of the essence. To address this shortcoming, this paper offers a non-invasive blood group recognition scheme, which is founded on fingerprint biometrics and deep transfer learning. In the proposed method, a pre-trained ResNet50 convolutional neural network that has been fine-tuned to learn discriminative ridge patterns and texture features of fingerprint images that are dependent on blood group characteristics are used. Model training and validation of a labeled fingerprint dataset are used to cover eight blood groups including ABO and Rh factor. Before classification, fingerprint images undergo preprocessing tasks of converting them into grayscale, normalizing, resizing, contrast enhancement, and data augmentation to enhance feature consistency and generalization. Early experimental outcomes reveal that the accuracy of the classification is 83.75, which proves that the process of blood group prediction based on fingerprints is possible. Additional optimization by hyperparameter control, dataset balancing and augmentation methods enhance the effectiveness of the classification to 96%. Accuracy, precision, recall and F1-score are used in evaluating the proposed model and features such as dropout, batch normalization and early stopping are incorporated as regularization techniques to prevent overfitting. The results of the experiment demonstrate the opportunities of deep learning-based biometric analysis as a quick, affordable, and portable alternative to the conventional blood group testing procedures.

69. ENHANCED LEARNING INTERFACE FOR PERSONALIZED SKILL ADVANCEMENT

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This project presents an AI-driven personalized learning platform designed to deliver adaptive, skill-based education tailored to each learner’s goals. The system automatically generates structured learning roadmaps based on the skill selected by the user. it uses topic decomposition and content aggregation techniques to break down complex subjects into manageable subtopics. Each learning module contains carefully curated resources gathered from multiple educational platforms including Coursera, Udemy, YouTube and GitHub ensuring comprehensive coverage of foundational to advanced concepts. A browser extension integrates seamlessly with the platform, enabling automated progress tracking, real time monitoring of video consumption and dynamic updates to module completion status. The platform also includes an AI-powered chatbot which provides contextual guidance, answers user queries and supports learners throughout their process of learning. Assessment mechanisms such as quizzes and mini projects etc are automatically generated using rule-based algorithms and GitHub project mining reinforcing practical learning and skill mastery. Upon completing the roadmap, learners undertake a capstone project and then receive an auto generated completion certificate and gain access to personalized job recommendations aligned with their skills. The platform continuously updates the progress dashboards to maintain a personalized and goal-oriented learning experience. By integrating

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content curation, AI assistance, automated assessment, project work, certification and career guidance into a single unified ecosystem, this platform provides a comprehensive solution for personalized online learning, bridging the gap between self paced education and professional readiness.

70. A LATENCY-AWARE MULTI-AGENT LLM FRAMEWORK WITH CONFIDENCE-GUIDED TRIAGE FOR DARK WEB CYBER THREAT INTELLIGENCE

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Dark web forums often function as early spaces where emerging cyber threats are discussed, shared, or informally disclosed. However, the unstructured nature of these discussions, along with constantly shifting terminology, makes automated intelligence extraction difficult. This paper introduces a latency-aware multi-agent Large Language Model (LLM) framework designed for zero-shot Cyber Threat Intelligence (CTI) classification over unstructured dark web text. The proposed system separates inference into two coordinated components—relevancy detection and threat categorization—both operating on shared semantic embeddings to improve reasoning consistency. To strengthen practical deployment reliability, a confidence-guided triage layer is incorporated, which flags uncertain predictions for analyst review while generating structured CTI reports for high-confidence outputs. Rather than relying on fine-tuned or monolithic LLM architectures, the framework focuses on embedding reuse and parallel execution to enhance throughput without retraining. Evaluation on a manually annotated dark web dataset shows improved classification stability compared to single-agent zero-shot inference, achieving 0.773 category accuracy and 0.779 relevancy accuracy while reducing average inference latency by approximately 22%. These results suggest that combining structured task decomposition with uncertainty-aware reporting can improve both operational efficiency and decision reliability in real-time CTI monitoring scenarios.

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71. A DEEP–ENSEMBLE CATBOOST–CNN FRAMEWORK FOR ROBUST CREDIT CARD FRAUD DETECTION

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Financial institutions increasingly face major challenges associated with credit card transactions due to the rapid proliferation of electronic payment systems. As every transaction must be verified before approval, attackers often attempt to impersonate legitimate cardholders to perform unauthorized activities. This research examines the efficacy of a unified fraud detection model that incorporates deep learning methodologies alongside machine learning strategies.. Experiments are conducted on two datasets: a real-world European credit card transaction dataset and a Sparkov- generated synthetic dataset. Models such as Naïve Bayes, Random Forest, XGBoost, and the proposed CatBoost–CNN framework are evaluated using precision ,recall, precision and F1 score. The results indicate that while ensemble models perform well on real transaction data, their performance drops on simulated datasets. The suggested hybrid method shows enhanced generalization, reduced false positives, and better fraud detection capability, especially in real-world scenarios.

72. AI-POWERED COMPANY-SPECIFIC MOCK INTERVIEW SYSTEM

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This project presents a customized AI-driven mock interview and candidate evaluation system to facilitate impartial, data-informed hiring choices. The system employs sophisticated Large Language Models (LLMs) to create interview questions tailored to specific companies and roles, mimicking real-life situations and guaranteeing relevance for every position. Responses from candidates are assessed instantly through natural language processing (NLP), sentiment analysis, and predictive analytics to gauge communication abilities, subject matter expertise, problem- solving skills, and behavioral characteristics. Automated evaluation, comprehensive performance analysis, and fit suggestions facilitate equitable and impartial candidate assessments. Furthermore, the system simplifies the complete interview process, covering question personalization, answer assessment, data analysis, and feedback creation. This AI- driven framework improves recruitment practices by enhancing reliability, allowing organizations to effectively identify the most suitable talent through reduced manual effort, decreased subjectivity, and increased consistency, accuracy, and efficiency.

73. AI-POWERED MCQ GENERATOR FROM UPLOADED DOCUMENTS USING sGEMINI API WITH USER AUTHENTICATION

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This paper proposes the design and implementation of an intelligent and document-based multiple-choice question (MCQ) generation and evaluation system based on large language models (LLMs). The proposed system allows to users with authentication to upload educational documents in PDF or DOCX formats and extracts textual content from them automatically while generating difficulty controlled MCQs according to the source of the information. Two alternative LLM backends are discussed: an alternative using the OpenAI GPT to the Google Gemini that highlight the difference on generation strategy, robustness and response pars. The system has session- based delivery of assessment, automated evaluation of answers, score calculation, and post-assessment feedback collection of difficulty. Lightweight storage using the native format, based on the lightweight, open-source Java application

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server, and a storage method, which is based on the Python language. The architecture gives proof of concept to realizing the interconnection of generative AI with web-based assessment platforms for implementing scales to enable scalable, adaptative learning and self- evaluation. According to the experimental observations, the design of questions (prompt design), output formatting constrains, and parsing reliability are critical for ensuring question uniqueness and accuracy during the scoring of the response. The proposed framework can be used as a basis for AI-supported educational assessment systems, and can be augmented with additional security, long-term database and learning analytics for real-world deployments. Keywords - Artificial intelligence, multiple choice question generation, large language model, educational technology, document-based assessment, Flask web application, GPT, Gemini, educational technology, automated evaluation, adaptive learning

74. GENERATIVE AI FOR SIMULATING AND OPTIMIZING IOT NETWORK PERFORMANCE

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We present GenIoT-Optimizer, a concise framework that uses generative AI (GANs, VAEs, and diffusion models) together with deep reinforcement learning to simulate traffic and optimize IoT networks. The framework generates realistic traffic, forecasts network states, and selects configurations that jointly improve latency, throughput, energy, and QoS. Experiments on three real IoT datasets show consistent gains over strong baselines, including lower latency, higher throughput, and better anomaly detection (F1 up to 91.8%). The approach is scalable and practical for edge deployments, offering a compact recipe for data-driven IoT network management.

75. AUTONOMOUS 6WD FACE AND VOICE RECOGNIZING ROBOT WITH INTERACTIVE TFT TOUCH DISPLAY

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The Autonomous Face-Recognizing Robot is an AI-powered robotic system designed to combine artificial intelligence, computer vision, and embedded control for intelligent surveillance and automation. The robot integrates ESP32-CAM, ESP32 Dev Module, AI Thinker VC-02 and Arduino Uno to create a hybrid system capable of both manual and autonomous operation. It addresses key challenges in smart monitoring, such as limited automation, manual human supervision, and the need for real-time recognition and navigation .The system includes several smart modules, such as AI-Based Face Recognition, Obstacle Detection, Dual- Mode Control (Manual & Autonomous), and a TFT Touch Display Interface. Using OpenCV and face recognition algorithms, the ESP32-CAM captures and analyzes live video to identify individuals from a trained dataset. The ESP32 Dev Module manages the six- wheel drive mechanism and processes data from ultrasonic sensors to detect and avoid obstacles in real time. The Arduino Uno operates the TFT touch display, allowing users to switch between control modes and monitor robot status interactively. By leveraging AI and embedded systems, the robot enhances automation, precision, and responsiveness. The dual-mode system allows for remote surveillance through manual control and self-driven operation through autonomous mode, making it adaptable for diverse real-world environments. The integration of MicroPython, machine learning, and sensor-based navigation demonstrates how AI can be effectively embedded into robotics for improved decision-making and human interaction.With applications in smart surveillance, attendance automation, and security monitoring, this project bridges the gap between AI and robotics. By promoting automation, efficiency, and intelligent interaction, it showcases the potential of AI-driven robotic systems in shaping the future of autonomous technology.

76. LAST-MILE DELIVERY OPTIMIZATION USING MACHINE LEARNING AND GENETIC ALGORITHMS

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Last-mile delivery represents one of the most complex and cost-intensive components of urban e-commerce logistics due to dynamic traffic conditions, heterogeneous rider capabilities, and strict delivery time windows. Existing heuristic-based rider assignment strategies are unable to adapt to dynamic urban conditions and heterogeneous rider capabilities, often resulting in increased delivery time and unbalanced workloads. This motivates the need for an adaptive, data-driven optimization framework. Efficient rider assignment and route planning under such constraints can be formulated as a dynamic variant of the Vehicle Routing Problem (VRP). This paper proposes a hybrid optimization framework that integrates machine learning–based delivery time prediction with a Genetic Algorithm

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(GA) for rider selection and multi-order assignment. The learning model estimates delivery times using spatial and operational features, while the GA minimizes predicted delivery time and balances rider workload under capacity constraints. A real- world case study based on Mumbai city data, visualized using OpenStreetMap, demonstrates the effectiveness of the proposed approach. Experimental results show improved delivery efficiency and more balanced rider utilization compared to heuristic assignment strategies, highlighting the scalability and practicality of the framework for urban last-mile logistics.

77. IOT-ENABLED COAL MINE SAFETY & HEALTH MONITORING WITH LORAWAN AND GENAI

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Coal mining is one of the most hazardous industries, where underground workers are continuously exposed to risks such as toxic gas accumulation, tunnel collapses, poor ventilation, extreme temperatures, and high humidity. Traditional safety approaches, including manual supervision and wired monitoring systems, are often reactive, slow to respond, and prone to human error, while being unable to anticipate potential hazards effectively. To address these challenges, this study proposes an IoT-enabled Coal Mine Safety and Health Monitoring System that integrates LoRaWAN technology for long-range wireless communication with Generative AI (GenAI) for predictive analytics. The system employs sensor nodes to monitor both environmental and physiological parameters, including methane (CH4), carbon monoxide (CO), oxygen levels, temperature, humidity, heart rate, and body temperature, which are transmitted in real-time via LoRaWAN to a centralized server. Generative AI algorithms analyze the incoming data to detect anomalies, predict potential hazards, and recommend preventive actions, enabling proactive safety management and timely intervention before critical situations escalate. Key features of the system include real-time dashboards, automated alerts, remote monitoring, and comprehensive data logging for post-event analysis. Simulation studies and experimental results

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demonstrate that the system significantly improves hazard detection, reduces response times, and enhances overall miner safety. Additionally, the scalable and adaptive design allows integration with larger mining networks and aligns with Industry 4.0 standards. By combining environmental sensing, physiological monitoring, long-range communication, and predictive analytics, this IoT and AI- driven framework provides a transformative approach to smart mining operations, offering a proactive, data-driven, and intelligent solution that minimizes accidents, safeguards miners' health, and promotes safer underground work environments.

78. LIVESHIELD: REAL-TIME DEEPFAKE AUDIO AND VIDEO DETECTION FOR LIVE COMMUNICATION PLATFORMS

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The rapid advancement of deep learning techniques has enabled the creation of highly realistic deepfake audio and video, leading to a significant rise in cybercrimes such as voice phishing, identity impersonation, and misinformation attacks. Existing deepfake detection systems mainly rely on analyzing recorded media, making them ineffective for real-time communication environments such as video conferencing, live streaming, and online meetings.This project proposes LiveShield, a real-time deepfake audio and video detection system designed to provide protection during live online interactions. The system continuously monitors and analyzes audio and video streams within the browser to identify inconsistencies commonly introduced by deepfake generation technologies. For video analysis, facial features such as eye blinking behavior, lip synchronization, and facial motion irregularities are examined using computer vision techniques implemented with OpenCV.js. For audio analysis, acoustic features such as pitch variations, frequency patterns, and spectral characteristics are extracted and analyzed using the Web Audio API to detect synthesized or manipulated voices. The proposed framework adopts a multimodal detection approach, combining both audio and video analysis to enhance detection accuracy while maintaining low latency required for real- time applications. Implemented as a JavaScript-based browser extension, the system can seamlessly integrate with web-based communication platforms and monitor live streams without interrupting the user experience. By enabling proactive detection of deepfake media during live communication, this project addresses an important security challenge in modern digital interactions and contributes toward building safer and more trustworthy online communication environments.

79. DEVELOPMENT AND CHARACTERIZATION OF GARLIC PEEL BASED HYDROGEL FILM FOR WOUND HEALING APPLICATIONS

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Garlic (Allium sativum) peel is a byproduct of agro-industry and is a good source of bioactive molecules with powerful antioxidant and antimicrobial active potential. This research article describes the formulation and characterization of an ethanolic garlic peel extract (EGPE). Fourier-transformed infrared spectroscopy (FTIR) of garlic peel powder did confirm the presence of hydroxyl (–OH),

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carbonyl (C=O), and sulfur (C–S) functional groups which indicate that antioxidants and antimicrobial compounds exist. EGPE was subsequently blended into a chitosan-based hydrogel film that was produced using the solar-casting technique using glycerol as a plasticizer. FTIR of the EGPE-chitosan film indicated clear evidence of molecular interactions between EGPE and chitosan showing that the bioactive compounds integrated into the polymer matrix. This modified EGPE-chitosan hydrogel film is an appropriate method for additional research in wound-healing and other biomedical applications.

80. AI-PERSONALIZED HEALTH RECOMMENDATION SYSTEM USING MACHINE LEARNING AND FULL STACK DEVELOPMENT

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This essay entails a personalized health recommendation assistant machine built around AI with the aid of machine learning algorithms and the full-guard web development of the specific prediction of a disease based on the mentioned symptoms. The list of symptoms, diseases, medicines, precautions, and diet plans are given with the medical data sets. These data sets undergo some preprocessing and are inputted to classification algorithms such as SVM,Random Forest, Gradient Boosting and others (SVM is seen to be most effective in cases where one has clean data sets). The system will tell you on the basis of the reported symptoms the most probable disease. It also gives solutions to the illness using user-friendly features of the web application developed using Flask, HTML, CSS and Bootstrap. The proposed system tries to close the gap that exists between existing systems, as most still do not provide useful guidance and implementation, which can be achieved by offering the advantages of making predictions and recommendations through the use of a single system that is scalable.

81. BLOCKCHAIN-ENABLED AI SYSTEM FOR SECURE HEALTHCARE DATA MONITORING AND CYBER ATTACK DETECTION USING OPTIMIZED ALGORITHMS

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The study proposes a secure transaction monitoring and analytics platform powered by AI and combining machine learning-based anomalous identification techniques with blockchain technology through data integrity. The suggested system is based on the ensemble learning algorithms, such as the Random Forest and Gradient Boosting, which are used together with unsupervised K-Means clustering to detect the presence of anomalous and possibly fraudulent transactions in structured security databases. A cryptographic hash algorithm, called SHA-256, is used to guarantee the immutability of transactions as well as their integrity before records are stored in a lightweight blockchain registry permanently. Fraud identification is rule-based and is introduced to improve real-time detection of high-risk-level transactions according to transaction attributes. The modular architecture implementation of the system is accomplished with an interactive Streamlit-based dashboard that assists in visualizing the anomaly score, clustering behavior, data integrity trends, and transaction volume metrics. As the experimental analysis proves, the system can identify suspicious activities, provide the transparency of transactions validation, support ongoing security surveillance. The suggested framework provides a queryable and scalable framework to secure data driven transaction analysis, which should be applicable within intrusion detection and prevention, financial accounting, and tier-1 environment in a distributed system.

82. ACCELERATED REAL-TIME IMAGE COMPRESSIONWITH MULTI-RESOLUTION ANALYSIS USING WAVELET TRANSFORM

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Real-time image compression plays an important role in bandwidth- and latency-limited applications such as medical imaging, surveillance, remote sensing, and embedded vision systems. The present paper introduces a multiresolution wavelet-based compression framework that integrates three-level Daubechies 9/7 discrete wavelet transform (DWT), level-dependent quantization, SPIHT coefficient coding, and entropy coding for scalable, real-time operation. This pipeline utilizes color-space conversion, chroma subsampling, and subband-specific thresholds to remove perceptually insignificant

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high-frequency components while preserving structurally important low-frequency content. Experimental evaluation on baseline test images shows that, at the same visual quality, the method performs approximately 25% below JPEG2000 bitrate on average and generally adds 0.2–0.4 dB of PSNR and small gains to SSIM. The implementation achieves encoding throughputs on a scale of 20–25 frames per second for 1080p images on a commodity CPU, showing it is applicable for near real-time. These results demonstrate that the proposed framework can provide a successful trade-off among compression efficiency, visual fidelity, and computational complexity for a more time-critical image setting.

83. AN AUGMENTED REALITY-BASED BIOMEDICAL EQUIPMENT CT SCAN PROCEDURE SIMULATOR

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Computed Tomography (CT) scanners are essential diagnostic tools in modern healthcare; however, practical training on real CT equipment is limited due to high cost, restricted accessibility, and potential radiation exposure risks. This creates a gap between theoretical knowledge and hands- on clinical experience among biomedical and radiology students. To address this problem, this paper proposes an Augmented Reality (AR)-based CT Scan Procedure Simulator that provides a safe, cost-effective, and interactive learning environment. The system is developed using Unity 3D integrated with Vuforia Engine, where a smartphone camera detects a predefined image target and overlays a virtual 3D CT scanner and patient model into the real-world environment. The simulator guides users through a structured step-by-step workflow, including patient preparation, positioning, scanning procedure, and result analysis using interactive visual instructions. The proposed methodology follows a sequential procedural visualization approach, where each step is controlled through user interaction using navigation buttons. The system focuses on improving conceptual understanding and procedural flow without exposing users to real radiation. The major contributions of this work include development of a mobile-based AR CT scan simulator, radiation-free training environment, step-by-step guided procedural learning, and improved accessibility for biomedical education. The results demonstrate that the system enhances learning engagement, accessibility, and repeatability compared to traditional training methods.

84. NEED FOR DATA AGNOSTIC MACHINE LEARNING MODELS

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Current state-of-the-art machine learning models, which are dependent on static and labeled datasets, are in- herently fragile and susceptible to performance deterioration due to a process called concept drift. This report proposes a completely new framework for model training that changes the paradigm from expensive and human-centric data labeling processes to utilize vast and easily accessible unlabeled datasets. This research shows how unsupervised and semi-supervised learning methods of pre-training, such as self-supervised learning, generative models, and autoencoders, can potentially be utilized for learning robust and generalizable representations of data that are non-sensitive to distribution changes. This framework will be applied using an online drift-aware system, implementing various learning methods and ensemble techniques for continuous adaptation. Additionally, this report will discuss the key ethical and technical issues of implementing this strategy, namely ”black box technology,” and proposes the integration of Explainable AI (XAI) technology, which will make it one of the foundational elements of this framework. Based on an in-depth analysis of theoretical, technological, and practical implementations, and various case studies of such applications in finance and health- care, this report will set out a complete roadmap for constructing the next generation of robust and ethical AI systems.

85. HISTORICAL RECONSTRUCTION USING AUGMENTED REALITY

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Cultural heritage sites often face challenges such as structural deterioration, environmental damage, or limited accessibility, making preservation and public engagement dif- ficult. Emerging digital technologies, particularly Augmented Reality (AR), provide innovative ways to experience and interact with such monuments. This paper presents an AR-based system designed to facilitate interactive heritage exploration through image-based recognition, photogrammetry-based 3D modeling, intelligent narration, and user-centered interaction. The proposed framework comprises four key modules: (i) an image-based AR visualization module that allows users to scan images of monuments from any location and view corresponding 3D models in an augmented environment, (ii) a QR code-based module enabling remote users to access and explore digital heritage content, (iii) an AI-driven voice assistant that provides historical explanations and answers user queries, and (iv) a "Wall of Fame" module that allows users to capture photos with AR models and download them as personalized digital souvenirs. A functional prototype has been developed using photogram- metry and Blender for 3D modeling, along with web technolo- gies such as HTML, Tailwind CSS, JavaScript, Three.js, and model-viewer for AR interaction. Initial evaluations show high engagement, smooth performance, and strong educational value. The system demonstrates the potential of a modular, web-based AR platform for cultural preservation, interactive learning, and location-independent access. Future work includes multilingual support and improved image recognition.

86. IOT-BASED SMART AGRICULTURE MONITORING SYSTEM WITH EFFECTIVE WATER MANAGEMENT USING STM-32 MICROCONTROLLER

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The integration of Internet of Things (IoT) and embedded systems has significantly improved modern agricultural practices by enabling smart and data-driven resource management. This paper presents an IoT-based Smart Agriculture Monitoring System designed to enhance irrigation efficiency and reduce water wastage using an STM32 microcontroller. The system adopts a master–slave architecture, where the ESP-01 module acts as the master and communicates with the ESP-32 slave node through the ThingSpeak cloud platform. The STM32 microcontroller, known for its low power consumption and high performance, processes real- time data collected from sensors measuring soil moisture, temperature, humidity, and water flow. Based on this data, the system automatically controls irrigation, ensuring optimal water usage. Additional features such as weather forecasting and zone-wise irrigation further improve decision-making and efficiency. To enhance system intelligence, a machine learning model based on the Random Forest algorithm is used to predict irrigation schedules and detect potential crop diseases. A mobile application developed using Kodular enables farmers to remotely monitor field conditions, receive alerts, and control irrigation systems without physical presence. Experimental results demonstrate that the proposed system achieves 30–50% water savings compared to traditional irrigation methods, while also improving energy efficiency and crop yield. The system is scalable, cost-effective, and suitable for both rural and urban farming environments, making it a practical solution for sustainable agriculture.

87. BRIDGING SILENCE: INDIAN SIGN LANGUAGE TRANSLATOR WITH MALAYALAM TEXT AND AUDIO OUTPUT

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There are not, however, presently many ways to translate gestures of the Indian, not to mention making them effective. There are Sign Language (ISL) to Malayalam audio output. The present work is a proposal of an ISL gesture recognition system, which will be a real-time system translation of hand gestures into Malayalam language according to the vision- based system. The MediaPipe analyzes the image of the live videos. to identify hands and landmarks with accuracy and follows up with classifying gesture through the use of machine learning. The gestures identified are translated. text to Malayalam

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The text-to- audio text-to- audio synthesizer processes the text input to produce audio output human text to Malayalam The text to audio text to audio synthesizer takes the text input and converts it into audio output speech module. The proposed system will be based on the standard executing real-time computing over generalized hardware. According to experimental determination, the system is stable when its performance is constant. the system is at normal conditions, and this implies that the environment is at normal conditions can be applied in practice in the terms of assistive communication and inclusive human-computer interaction.

88. MULTIMODAL MEDICAL IMAGE FUSION BASED ON TWO SCALE DECOMPOSITION

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Multimodal medical image fusion is the most important tool used for medical and clinical applications. The motivation of image fusion is to obtain more useful and detailed information into a composite image from the source images. The multiscale decomposition provides more flexibility and choice in selection of the appropriate fused images by varying from minimum to maximum level using maximum selection rule .The most challenging task is estimating the wavelet transform decomposition levels which leads to the use of multi-scale image fusion .The required operations are performed on fused image by varying the scale but selection of wavelet is the main issue. As the scale is high, fused image contains more details of source images. For preserving the more useful and appropriate information of poor contrast medical images, two scale image fusion is proposed. In this paper, PCA based two scale fusion method is proposed for multimodal medical images. The source images are decomposed into base and detail layers. Optimal weights are constructed by fusing the prinicipal components of detail layers and maximum selection rule is used for base layers to extract edges, boundaries. Image reconstruction is done using the linear combination of detail and base layers. Comparison of proposed method with different fusion methods validate that our method is giving superior performance than the existing methods. Thus our method is preferable in real time application because of less consumption of computational time.

89. FEDERATED LEARNING FOR ASTHMA PATIENT RISK ANALYSIS: A SYSTEMATIC REVIEW

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Unlike reviews that focused on imaging or general electronic health record applications this work uniquely brings together asthma-specific machine learning, wearable monitoring and frameworks that protect user privacy. This study evaluated performance using measures like AUC, recall and calibration. These measures show that the methods used were thorough and that there were different ways to define outcomes. The review found some challenges. These include data that is not easily categorized much communication required and noisy labels in severe asthma events. The review highlights chances to improve asthma risk prediction. It suggests using types of data, personalized strategies and stronger privacy protections. It also recommends validating these methods in centers and using federated phenol typing. Overall it creates a plan for federated asthma risk prediction. This plan connects progress with practical use, in clinics. Earlier FL reviews focused on imaging or general EHR applications, this work uniquely integrates asthma specific machine learning, wearable monitoring, and privacy preserving frameworks. Performance was commonly assessed using AUC, recall, and calibration, underscoring methodological rigor and variability in outcome definitions. Key challenges identified include non IID data, communication overheads, and label noise in exacerbation events. The review highlights opportunities for multimodal federated pipelines, personalization strategies, and privacy guarantees, while recommending multi center validation and federated phenol typing. Overall, it establishes the first structured roadmap for federated asthma risk prediction, linking technical advances with clinical translation.

90. PREDICTIVE ANALYSIS OF CHRONIC HEART FAILURE USING MACHINE LEARNING AND DEEP LEARNING TECHNIQUES

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Chronic Heart Failure (CHF) is a medical condition that lasts a long time and where the heart is unable to pump up the required amount of blood to provide the body with energy. It has been among the leading causes of death and morbidity in the world particularly among the elderly. Early predicting and prompt action can significantly reduce the number of individuals who should attend the hospital, increase patient outcomes, and decrease the cost of care. The traditional methods of diagnosis are also based on clinical knowledge, laboratory findings and imaging tests; which are time consuming, costly and subject to human error. As electronic health records (EHRs) and medical data sets get more accessible, ML tools are a promising approach to CHF prediction, which is accurate and timely.The proposed model consists of data pre-processing, feature selection, training and performance evaluation in terms of the accuracy, precision, recall, and F1-score as performance measures. The various ML algorithms are compared and analyzed in a bid to achieve the most efficient model. The results of the experiment indicate that the accuracy of the diagnosis in case of the application of ML to make predictions is much higher than when the traditional statistical method is applied. The system is an inexpensive, scalable, and dependable doctor decision-support system, which assists doctors to diagnose and treat early CHF patients.

91. A SELF-SUPERVISED MARITIME ANOMALY INTELLIGENCE FRAMEWORK FOR DETECTING COVERT EGG-POACHING ACTIVITIES IN ECOLOGICALLY SENSITIVE COASTAL ZONES

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Poaching, hatching of animals, of wildlife and their eggs in and around sands and other vulnerable areas of nesting hatchlings pose a risk to the delicate marine ecosystems, and are hardly known through the traditional methods of monitoring. This paper introduces an anomaly detecting machine based on deep learning that detects suspicious vessel behavior with the use of Automatic Identification System (AIS) data and environment. An independent-aid learning method is utilized to simulate normal ship movement behavior, speed, and heading, appearance, and activity in the area of sensitivity. Acts that go against normal behavior learnt like spending extended time in station, or slow slumber, or nightly encounters are automatically coded as possible unlawful acts. The suggested system is real time, does not need any data regarding the illegal activities labeled and generates easy to interpret outputs to the enforcement agencies. Experimental assessment reflects the high detection reliability which underlines the efficiency of the system as a scalable and cost-effective system of coastal wildlife protection.

92. AN INTEGRATED AI-POWERED AGRICULTURAL SOLUTION FOR OPTIMIZING FARMING PRACTICES AND RESOURCE MANAGEMENT

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The challenges encountered in agriculture today are associated with the choice of crops, using of fertilizers, monitoring of the health of plants and making decisions in time. To solve these problems, this study introduces an innovative comprehensive intelligent agricultural decision support system that integrates the application of machine learning, image analogy, and advisory intelligence into a single platform. The suggested system pays attention to crop recommendation based on soil nutrient and climatic information with the help of supervised machine learning models, which will allow farmers to choose appropriate crops in the condition of this field. An ensemble approach to building a fertilizer recommendation module is created through the application of ensemble learning methods designed to propose the appropriate application of fertilizers to maintain balanced nutrient management based on soil characteristics, crop species, and the environment. Furthermore, the system also involves plant disease detection through image analysis and therefore, there is an early detection of crop diseases based on the leaf images and enhancing preventive measures. In order to improve the usability and decision support, an expert advisory module is included to offer context-aware advice based on crop health and management practices. The general architecture is similar in the way that machine learning inference services and application level services are hosted on scalable web technologies. The system provides the recommendations in real-time based on REST-based interfaces, and it is easy to integrate. The given strategy shows how the combination of machine learning and intelligent advisory systems can help improve precision agriculture, as well as foster sustainable farming practices.

93. PREDICTIVE ANALYTICS FOR CARDIOVASCULAR HEALTH USING MACHINE LEARNING TECHNIQUES

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cardiovascular disease (CVD) remains a major health problem in the world, and the introduction of novel methods to detect the disease at an before time stage and evaluate the risk factor is necessary. This paper presents a predictive model that is built using machine learning and aims to find the risk of heart disease based on critical clinical and lifestyle factors. The study uses a Linear Support Vector Machine (SVM) classifier, which is a high-order computing method to calculate and analyze diverse patient health information. The research design includes the consolidated data of patient health records, in which various physiological and behavioral indicators such as age, blood pressure, cholesterol level, and physical activity patterns were assessed in a systematic way. The Linear SVM classifier was chosen because of its outstanding effectiveness in complex medical data analysis and it is also efficient in diagnostic prediction. Experimental findings indicate extensive predictive power and the model has 76% overall accuracy, 82% precision, 80% recall, and Area Under Curve (AUC) of 0.87. The overall high performance of the Linear SVM was verified with the help of comparative analysis with other machine learning algorithms and it can be noted that the Linear SVM can be a strong diagnostic tool. The paper highlights the potential of machine learning to revolutionize preventive healthcare and provides a possible solution on how cardiovascular disease can be identified earlier.

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94. SYSTEMATIC OPTIMIZATION OF RETRIEVAL AUGMENTED GENERATION SYSTEMS WITH HYBRID RETRIEVAL AND CLAIM-LEVEL VERIFICATION

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Retrieval-Augmented Generation (RAG) systems ad- dress large language model hallucinations by grounding responses in external knowledge bases, yet systematic evaluation of design choices across chunking, indexing, retrieval, and generation remains limited. We present an eight-phase experimental protocol that isolates and optimizes each architectural component through controlled ablation studies. Our claim-level faithfulness verifica- tion decomposes generated responses into atomic statements and validates each against retrieved context via Sentence-BERT sim-ilarity, achieving 92.1% precision versus 71.3% for embedding-based baselines, a 20.8 percentage point improvement. Systematic optimization reveals that 400–600 character fragments provide optimal context granularity with 9.3 percentage point faithfulness improvement over 200-character baselines, while approximate HNSW indexing reduces query latency by 85% with no faithful-ness loss. Model selection is found to be the dominant factor, where gemma2:9b-instruct is found to perform better than smaller models by 35.5 percentage points, followed by context ordering, where there is a degradation of 25 percentage points when using worst-first ordering. Retrieval depth is found to follow an inverted U-shape, where $k = 3$ is seen to perform better in terms of 100% faithfulness compared to 83.3% when $k = 5$ due to noise accumulation, whereas hybrid retrieval using $\alpha = 0.5$ Reciprocal Rank Fusion is seen to attain 96% of pure dense quality with a latency reduction of 20%. Experimental results on a 24 document technical corpus show that model selection and context ordering together account for an improvement of 60.5 percentage points.

95. ASAC-AI: AN AI MODEL TO DETECT MANIPULATED MEDIA

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The rapid growth of generative AI has made creating realistic but falsified images and videos increasingly effortless, posing serious challenges to media authenticity and cybersecurity. ASAC-AI is a deep learning–based system designed to detect and explain manipulated media using Convolutional Neural Networks and Grad-CAM visualization. Built with TensorFlow and deployed on AWS Cloud through FastAPI and Next.js, the system provides real-time, explainable analysis for image authenticity verification. Achieving an accuracy of 94.2%, ASAC-AI effectively identifies subtle manipulations such as splicing and cloning. By integrating transparency, scalability, and usability, it offers a reliable tool for journalists, investigators, and digital forensics experts to combat misinformation and ensure trust in digital media.

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96. AFANET: END-TO-END ADAPTIVE FUSION ATTENTION NETWORK FOR EFFICIENT AND BALANCED ECG ARRHYTHMIA DETECTION

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Analysis of electrocardiogram is very important. Automatic cardiac diagnosis and localization with (ECG) sig- nals. arrhythmias. The use of deep learning (DL) has been applied. ECG based classification of cardiac problems, however. its application in clinical environments is still restricted. The method entails derivation of features and pattern classifi- cation. The latest advances in artificial intelligence demonstrate that Features can be extracted using deep neural large-scale trained networks. directly.and find cardiac arrhythmias better than those of cardiologists[1][2]. In this paper, an Adaptive Fusion Attention Net- work (AFANet) is introduced to overcome current issues, like class.lack of balance, inter-patient variability and poor rep- resentation. learning, to large ECG arrhythmia classification. The model is a combination of a multi-scale Convolutional Neural. Network (CNN). channel recalibration encoder and hybrid Bidi- rectional. Multi-Head Self-Long Short-Term Memory (BiLSTM). Attention module for better temporal modeling. A composite loss function that incorporates reconstruction-sensitive supervision. and imbalance sensitive classification improves recognition of. minority classes without making the computation inefficient. The framework is created to be used in inter-patient assessment through the MIT- BIH Arrhythmia Database with the aim to enhance generalization. pragmatic deployability of clinical decision support systems.

97. SALES PERFORMANCE AND PRODUCT DEMAND PREDICTION DASHBOARD USING MACHINE LEARNING

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The rapid expansion of the internet-based retail sector has led to overwhelming numbers of consumer-generated data, but many businesses continue to use backward-looking statistical models that do not allow for tracking of changes in demand in real time. Typical forecasting techniques using ARIMA or exponential smoothing can only deal with numerical transactions leaving the qualitative data in customer reviews unused. This gap causes inconsistencies between what consumers wanted and what companies have. This phenomenon has been documented and is known as demand amplification or bullwhip syndrome. The current effort is creating the Sales Performance and Product Demand Prediction System, a dual-layer analytic system combining opinion mining and time-series forecasting techniques. The first layer uses the Domain-specific-Sentiment- Topic (DSTS) system to extract aspect level sentiment from e- commerce reviews and map them to operational categories outlined by the Supply Chain Operations and Reference (SCOR) model (Plan, Source, Make, Deliver, and Return) . This mapping allows for conversion of raw text to cause level indicators that allow managers to distinguish whether a decline in sales results from defect in manufacturing (Make) or poor delivery (Deliver). The second layer is the Autoregressive Review Influence Model (ARRIM), A study conducted by researchers examined the time delay between ups and downs in sentiment as measured from detectable changes through to the point at which there are quantifiable impacts on sales volume. The study utilized lag- adjusted (i.e., forward looking) sentiment as a predictive tool, which led to a substantial increase in performance of the model compared to traditional methods that only rely on historical sales data. An interactive Streamlit-based dashboard provides the ability to operate across both levels, allowing for clear model outputs that translate into "Buy," "Hold," or "Stop" procurement directives through an easy-to-use Decision Center user interface. Empirical testing across six tea product lines resulted in an increase of 25% per product in R-squared, indicating that their expectation of future sales will improve based on these methods. In addition to substantial improvements in predictive accuracy, the results also indicate that systematically including consumer voice in demand planning will provide significantly more cost- effective ways to manage inventory over the long term. [3-5]

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98. A UNIFIED AI-BASED VIRTUAL STYLING SYSTEM FOR PERSONALIZED OUTFIT, HAIRSTYLE, MAKEUP, AND ACCESSORY SELECTION

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Contemporary virtual styling applications fall short in delivering realistic, fully-personalized try-on experiences. Most existing tools address a single domain— outfits, makeup, or hairstyles—without unifying them into a cohesive system tailored to individual user features. This paper presents a unified AI- powered virtual styling platform implemented as a Flutter mobile application, integrating four specialized modules: outfit recommendation, makeup simulation, hairstyle selection, and accessory placement. The system combines HR-VITON for re- alistic clothing visualization, MediaPipe for facial and body landmark detection, a CNN-based skin analysis pipeline, a multi- factor weighted ranking engine for personalized suggestions, and pose-aware rendering for natural compositing across all styling domains. Outfit try-on is achieved through pose estimation, human parsing, cloth warping, and image synthesis, followed by Real-ESRGAN post-processing to sharpen resolution and reduce artifacts. Makeup analysis employs MediaPipe FaceLandmarker for region extraction and a CNN supplemented by heuristic fall- back for skin-type classification, with rule-based product selection and OpenCV blending applied in professional makeup order. Hairstyle recommendation proceeds through a five-stage pipeline: CNN-based face-shape inference via DeepFace, a six-dimension weighted scoring function for ranked style selection, and alpha blending with HSV recoloring for final compositing. Accessory placement uses MediaPipe Pose to locate anchor landmarks, dynamically scaling and positioning caps, glasses, jewelry, and watches for a natural appearance. All four modules share a single input image, operate in parallel, and render a complete, unified styling transformation. Experimental results demonstrate that integrating HR-VITON garment synthesis, MediaPipe landmark detection, CNN-driven skin analysis, and weighted ranking yields a scalable, effective approach to realistic fashion visualization and personalized style exploration.

99. A MULTIMODAL MACHINE LEARNING FRAMEWORK FOR EARLY DETECTION OF PARKINSON'S DISEASE USING VOICE AND MRI DATA

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Parkinson's Disease (PD) is a progressive neurode- generative disorder characterized by both motor and non- motor symptoms that affect speech, movement, and cognitive functions. Early and accurate diagnosis is essential for effective treatment and improved patient outcomes. This paper presents , a multimodal machine learning framework for the early detection of Parkinson's Disease using voice signals and brain MRI data. The proposed system extracts acoustic features from speech recordings and utilizes deep learning models to analyze structural patterns in MRI images. A feature-level multimodal fusion strat- egy is employed to integrate information from both modalities, enhancing diagnostic accuracy and robustness. Experimental results demonstrate that the proposed multi- modal approach achieves an accuracy of 95% and outperforms single-modality methods in detecting early-stage Parkinson's Disease. The system is non-invasive, cost-effective, and suitable for real-world clinical applications, highlighting its potential as a reliable decision-support tool in neurological diagnosis.

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100. A SMART COLOR ADVISORY ENGINE FOR FASHION USING WEATHER AND BEHAVIOURAL DATA

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The weather conditions have a significant impact on our clothing choices by affecting both comfort and psychological states. However, many existing systems do not take contextual environmental factors such as weather and the psychological influence of color into consideration. This paper presents a Smart Color Advisory Engine that models the relationship between weather conditions, color psychology and mood-related behavioral tendencies to generate context aware clothing recommendations. The proposed system predicts a continuous clothing color in RGB space using forecast weather parameters such as temperature and weather conditions. Additionally, the system also suggests suitable fabric types to improve thermal comfort under varying environmental conditions. The system uses a three-tier design that includes a React based user interface, a Node.js/Express backend and a Python based machine learning inference layer. A Random Forest multiple output regression model predicts RGB color values. External APIs retrieve weather forecast and generate images of outfits. The proposed system shows the feasibility of integrating environmental context, behavioral insights and machine learning to support practical and interpretable fashion recommendations.

101. HYBRID DEEP LEARNING FRAMEWORK FOR MULTIMODAL TUMOR DETECTION AND SEGMENTATION IN MRI AND CT IMAGES

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Medical imaging is an important part of the modern clinical diagnosis, and it should include tumor detection and segmentation that are necessary to detect cancer at an early stage and plan the treatment. Nonetheless, MRI and CT images are time-consuming and open to variability in terms of interpretation by humans because of the complicated nature of anatomy and the thinness of tumor edges. In this paper, a hybrid deep learning architecture has been introduced, using which localization and segmentation of tumors are performed as a single system. R-CNN is adopted when it is necessary to identify and localize the tumor areas more precisely, whereas U-Net is adopted when it is necessary to segment the identified areas and focus on the fine-grained pixel-level. In order to improve the performance of models, a powerful preprocessing pipeline is used, which consists of image resizing, intensity normalization, contrast enhancement, and noise reduction. The presented framework providers are in favor of multimodal imaging inputs, which thereby facilitates analysis of both MRI and CT images. A medical practitioner friendly interface is created where medical images can be uploaded easily and where visualization of the detected tumor areas and segmentation mask can be clearly seen. The findings of the experiments prove that the combined methodology enhances detection accuracy and precision of segmentation in various tumors and under various imaging parameters. The proposed system increases radiologist workload and lowers the capabilities of the work system by utilizing localization and segmentation, which is more reliable and can be applied faster. The framework has a high capacity of being incorporated into real-time health programs and computer-aided diagnosis programs.

102. MULTILINGUAL HATE SPEECH DETECTION USING FASTTEXT EMBEDDINGS AND TRANSFORMER-BASED ARCHITECTURES

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Hate speech detection meanly automatically identifying harmful or abusive type of language written again individuals or communities. With the growth of multilingual social media content, detecting hate speech across different languages has become increasingly challenging. There are some traditional machine learning models which mainly lack contextual understanding and struggle with semantic variations across languages, limiting their performance. To solve these limitations this study proposes a multilingual hate speech detection framework with the help of FastText embeddings combined with machine learning, deep learning and transformer-based models. FastText was used to capture subword-level semantic representations, improving language adaptability. Experimental results shows that transformer- based models outperform traditional approaches with BERT achieving the highest accuracy of 77%. The findings show the importance of contextual embeddings for strong multilingual hate speech detection making it best performing model in this study.

103. PLACEMENTAI: A UNIFIED ARTIFICIAL INTELLIGENCE FRAMEWORK FOR INTELLIGENT CAMPUS PLACEMENT READINESS AND CAREER PATH OPTIMIZATION

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The problem area of campus placement preparation is arguably one of the most critical but systematically underserved areas that engineering graduates face across India and the larger developing world. The fragmented nature of existing tools, each serving only a small part of the placement preparation pipeline, has meant that engineering graduates lack a unified, adaptive, and deeply personal intelligent system that can assist them throughout their placement preparation journey. The paper proposes a complete artificial intelligence-based placement preparation system named PlacementAI, comprising nine intelligent modules such as Placement Probability Prediction, Skill Gap Analysis, AI-Powered Interview Simulation, Resume ATS Scoring, Company Fit Prediction, Personalized Learning Path Generation, Project Evaluation, Placement Trend Analysis, and a Conversational Career Mentor. The proposed system utilizes a hybrid intelligent backbone comprising a pre-trained deep learning-based profile scoring network and the Mistral Large Language Model. The paper proposes a new methodology named "Structured JSON Output Schema" (SJOS), ensuring deterministic, parseable, and transparent output from all nine intelligent modules of PlacementAI. The "Multi-Dimensional Student Profile" (MDSP) represents student profiles as a collection of seven orthogonal student attribute dimensions. The experimental evaluation on 200 anonymized student profiles shows that the model achieves 91.4% Placement Prediction Accuracy, 0.893 Resume ATS F1-Score, 0.876 Interview Evaluation Pearson Correlation with human expert raters, 94.2% Skill Gap Coverage Rate, and 87.5% Learning Path Adherence, surpassing all five state-of-the-art baseline systems by two to four percentage

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points on every measure. Ablation study validates the unique contribution of each architectural choice. PlacementAI sets a new benchmark in AI-powered career intelligence platforms.

104. MACHINE LEARNING FRAMEWORK FOR PREDICTING MODE OF CHILDBIRTH

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Accurate prediction of the mode of childbirth is critical for ensuring maternal and neonatal health outcomes. Traditional approaches rely heavily on a physician's clinical experience and manual judgment, which may overlook important maternal and fetal factors influencing delivery decisions. Although existing machine learning–based solutions have shown promising results, many of them involve complex feature engineering, high computational costs, and lack user-friendly interfaces for real-time clinical deployment. This research develops a data-driven framework utilizing Random Forest and XGBoost models to accurately predict the mode of delivery. A structured CSV dataset containing maternal and pregnancy-related health parameters is utilized for model training and validation. The proposed framework enables both individual and bulk prediction capabilities through an intuitive web-based interface developed using Python, Flask, and HTML/CSS. Standard performance evaluation measures such as accuracy, precision, recall, F1- score, and ROC-AUC are utilized to evaluate and compare the effectiveness of the models. Experimental findings indicate that the system delivers rapid, accurate, and dependable predictions, highlighting its suitability for deployment in real-world healthcare applications.

105. MECHANICAL CHARACTERIZATION AND PARAMETRIC ANALYSIS OF 3D-PRINTED NATURAL FIBER REINFORCED POLYLACTIC ACID (PLA) COMPOSITES

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The present work investigates the effect of natural reinforcement type and fused deposition modelling (FDM) process parameters on the mechanical performance of polylactic acid (PLA)- based composite materials. Biopolymer 4043D PLA was selected as the matrix material and reinforced with bamboo carbon, coconut shell powder, and rice husk at a constant reinforcement content of 3 wt%. Prior to composite fabrication, the reinforcement powders were characterized using Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), X-Ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR), and Thermogravimetric Analysis (TGA) in order to examine their morphological, structural, chemical, and thermal behaviour. The developed reinforced PLA filaments are used for the fabrication of test specimens through the FDM process. The study considers four printing parameters, namely infill pattern (line, cubic, trihexagonal), layer height (0.1, 0.2, 0.3 mm), raster angle (0°, 45°, 90°), and infill density (10% and 20%), to evaluate their influence on mechanical response. A Taguchi L18 orthogonal array is adopted for systematic experimental design and parameter analysis. The printed specimens are evaluated through tensile and three-point bending tests to determine the strength and flexural behaviour of the composites under different reinforcement and printing conditions. The study aims to identify suitable combinations of reinforcement type and printing parameters for improving the mechanical performance of sustainable 3D printed PLA composites.

106. KILLCORE: A HARDWARE BASED INTRUSION DETECTION AND DATA PROTECTION SYSTEM

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As we know that modern embedded system store more sensitive data . It can be anything such as cryptographic keys , authentication credentials and configuration parameters. Loss of such sensitive data can lead to comprise in data integrity and confidentiality. To improve the security of embedded system we proposed a system called Killcore : Hardware Intrusion Temper Detection System. The main idea behind this approach is to detect tampering in real time and respond immediately to prevent data leakage. There are various units in our system LM393 continuously monitors I2C communication lines and supply voltage. If it detects any abnormal variation due to external interference or fault injection so it will be called as tamper event. When tamper event is detected, the ESP32 triggers an interrupt- driven response. It stops working normally and take security measures.24LC512 EEPROM is a storage device. OLED is used to show real- time system status and alerts. To prevent physical attacks such as bus probing and power glitching this approach can be helpful, than any other software method. The system is compact, cost-effective and suitable for real – time applications in IOT and embedded environments.

107. AN EVENT-ADAPTIVE DEEP LEARNING FRAMEWORK FOR EXTREME WEATHER PREDICTION

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Accurate prediction of extreme weather events remains a significant challenge due to nonlinear atmospheric interactions, temporal variability, and severe class imbalance in observational datasets. This study proposes an event-adaptive deep learning framework for prediction of extreme weather events such as heat wave, cold wave, heavy rainfall, and thunderstorm using multivariate surface observatory data. Sequential models including Recurrent Neural Networks (RNN), Long Short-Term Memory (LSTM), and Gated Recurrent Units (GRU) are compared with a tree-based boosting model (XGBoost). Class- weighted training is employed to address rare event imbalance. Performance is evaluated using operational meteorological metrics such as Probability of Detection (POD), False Alarm Ratio (FAR), and Critical Success Index (CSI). Results indicate that persistent temperature-driven extremes are better captured by memory-based architectures, while short-duration convective events favor boosting methods. The findings highlight the necessity of event-specific model selection in operational extreme weather forecasting systems.

108. ADAPTIVE FUSION OF NEURAL COLLABORATIVE FILTERING AND GATED RECURRENT UNITS FOR OPTIMISED RETAIL RECOMMENDATION

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Recommendation systems are now a key component of modern virtual platforms particularly in e-commerce where interaction occurs with large number of users Conventional recommendation methods such as collaborative filtering and matrix factorization depend on previous user-item interaction data Although these methods fail to incorporate temporal dynamics present in user behavior. This work develops the hybrid recommendation architecture which integrates Neural Collaborative Filtering with a sequential modeling component based on Gated Recurrent Units. The proposed framework captures

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long-term preference patterns and short-term behavioral patterns from interaction sequences. The hybrid architecture results in personalized and context-aware recommendations.

109. REAL-TIME SIGN LANGUAGE RECOGNITION USING DYNAMIC NETWORKS AND CAPSULE NETWORKS

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Even though sign language serves as a primary means of communication for many, interacting with non-signers remains difficult. Technology offers one path forward by translating gestures into understandable forms quickly and precisely. This work presents Smartsigncaps, an approach that combines flexible neural networks with capsule architectures to detect signing in real time - moving beyond conventional methods. Input arrives as video, which the system analyzes using OpenCV to extract hand regions, suppress noise, and normalize size automatically. What sets it apart is how capsule-based dynamic routing preserves structural details of hand postures, maintaining performance even when viewpoints change or backgrounds grow complex. Out in the digital distance, computations unfold through tools such as AWS Lambda and SageMaker - mixing quick results with adaptability. When a movement is recognized, speech or text emerges instantly via a Flask-based interface, turning motion into communication just in time. Where most CNN methods fall short, this approach stands out by boosting accuracy in recognition tasks. Its design adapts easily to different educational contexts, group interactions, or human- machine communication setups. Rather than locking into one format, it shifts smoothly between varied conditions. Performance stays consistent even when surroundings change. What sets it apart is how well it maintains precision without rigid requirements.

110. INSTANTFIXAR-REMOTE AUGMENTED REALITY REPAIR ASSISTANCE

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The fast-moving development of remote continuance must call for the emulsion that viaduct the gap between the expert knowledge and present identical market user experience. This writing paper shows that the InstantFixAR is a web based application tele assistance framework this designed is to alter the technical support for both house-based repairs and heavy industrial machinery. Distinct traditional system that rely on static manuals or high bandwidth video calls our reach integrates an hybrid methodology of computer vision and behavioural science. Scientifically that we address that provocation of the low illumination environments by implementing the High Resolution with "Dark Mode" Equalization modules this utilizes the Otsu method for data segmentation and maximum entropy model to enhance the dynamic range ensuring strong detail retention. Operationally we replace static instruction with Reconfigurable AR Procedures, enabling experts to deploy dynamic 3D checklists that reduce cognitive load. Furthermore to ensure user adoption, we incorporate the Extended Technology Acceptance Model. A pre session TPACK (Technological Pedagogical and Content Knowledge) assessment diagnoses user readiness and automatically adjusts Motivational Support levels to enhance perceived ease of use. Finally a people oriented Sustainability Tracker quantifies the reduction in trial and error cost and carbon emissions validating the platform as a sustainable carbon neutral solution for the modern maintenance landscape.

111. NEUROTWIN: A MULTI-AGENT AI LEARNING COMPANION FOR COMPETITIVE EXAM PREPARATION

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The emergence of digital learning systems has significantly transformed academic research. However, most existing digital systems use inflexible models of information presentation and schedule that do not account for different learning behavioral patterns. Students enrolled in preparatory classes for challenging entrance examinations have distinct mental abilities that reflect various levels of information memorization, comprehension, response accuracy, and confidence. The learning

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management system does not continuously track dynamic changes in cognitive parameters to enhance time management and revision. To solve this issue, the following paper discusses NeuroTwin, an innovative tool as a cognitive digital twin that can adapt to changing situations. This framework comprises multiple elements, including systematic syllabus analysis, intelligent learning planning, AI-based tutoring, adaptive testing, and spaced repetition practice, based on the multi-agent model. The back-end, implemented by a FastAPI server, is responsible for cognitive states modeling, cognitive lifecycle transitions, and performance analysis. At the same time, the front-end, constructed on React technology, creates favorable conditions for studying. Adjustments of the level of learning complexity, revision intervals, and topics' interest are made according to performance metrics collected in real-time. Simulated workflows demonstrate the advantage of NeuroTwin over traditional learning strategies in terms of information retention, scheduling efficiency, and personalization.

112. EMPOWERING MRI-BASED BRAIN TUMOR DIAGNOSIS WITH DEEP CNN'S FOR ACCURATE DETECTION, INTELLIGENT STAGING, AND AUTOMATED CLINICAL REPORTING-

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Brain tumors are one of the critical neurological disorders and, if not diagnosed early enough, may threaten human health. Tumor presence, type, and size have to be identified accurately from the MRI scans to assist in the appropriate treatment planning for improving the survival rates among the patients. However, conventional diagnosis of brain tumors relies heavily on manual visual inspection of MRI images by radiologists. The process is usually time-consuming, expertise-dependent, and prone to human error when volumes of medical data are large. To overcome these limitations, this paper proposes an automated brain tumor detection and classification system using MRI images. In the proposed approach, advanced image preprocessing and segmentation techniques are utilized for accurately extracting tumor regions and calculating tumor size as a percentage of the affected area of the brain. The segmented image from MRI is further used for tumor classification by a Convolutional Neural Network into glioma, meningioma, pituitary tumor, etc. Along with diagnosis, this system provides personalized food recommendations, guidance on healthcare consultation, and suggestions on day-to-day routines based on the type and severity of the tumor. Experimental results show that the proposed system achieves high accuracy, good generalization, and consistent performance across different MRI datasets compared with state-of-the-art traditional methods. It is an efficient, scalable solution with the

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potential for real-time clinical applications. In fact, the proposed framework integrates tumor detection, classification, size estimation, and health recommendations after diagnosis into one platform that fosters early intervention, enhances clinical decision-making, and addresses holistic patient care.

113. MACHINE LEARNING-BASED PREDICTION OF CHEMOTHERAPY-INDUCED NEUTROPENIA WITH ROBUST TIME-DELAYED CONTROL FOR DRUG OPTIMIZATION

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Chemotherapy stands as a main treatment method for cancer, yet its adverse effects create dangerous conditions like neutropenia that prevent treatment completion and endanger patient lives. The study presents an integrated machine learning and control theory decision-support system which optimizes chemotherapy planning through its decision-making capabilities. Two advanced deep learning models were trained on artificial clinical time-series datasets to forecast future neutropenia development through the black-box BiLSTM model and the interpretable RETAIN model. An advanced TDE controller was developed which calculates optimal chemotherapy dosages based on tumor growth behavior during external disruptions. The system combined both components into an online interactive dashboard which enables clinicians to enter patient information and obtain predictions about risk and tumor response and recommended dosages. The system currently distinguishes between low-risk patients and high-risk patients while it plans to implement moderate-risk classification in upcoming development work. Through predictive modeling and adaptive control mechanisms, the combination of both methods leads to better treatment safety and enables development of personalized chemotherapy dosage plans.

114. EXPERIMENTAL CASE STUDY ON STRUCTURAL PERFORMANCE OF GFRP AND MODIFIED GFRP REINFORCED CONCRETE BEAM

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Glass fiber reinforced polymer (GFRP) rebars are weak in shear strength and flexural strength is a major investigation of this project. GFRP Rebar is most suitable alternative having excellent in light weight,

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resistant to corrosion and rate to weight ratio. However, limitations like ductility, fracture and insufficient bond behavior with concrete. The modifications of GFRP rebars which increase bond stress load transmission and flexural performance more than conventional GFRP rebars. This modification contents spiral binding by binding wire and epoxy resin coating. This process consists material selection, mix design of the Grade M30 concrete, preparing reinforcement from TMT, GFRP and Modified GFRP for casting and curing of beam. From this flexural strength test on beam carried out. Key observation shows that modified GFRP reinforced beam shows greater Flexural strength, better crack execution and improved in capacity to carry loads compared to standard GFRP beams.

115. A LORA-ENABLED AUTONOMOUS ROBOT FOR PRECISION FARMING WITH A DIGITAL TWIN

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Precision farming has increasingly relied on au- tonomous sensing and decision-making systems based on data in order to increase crop yields. The conventional method of soil testing involves manual collection of soil samples and analysis in the laboratory. This process has resulted in a waiting period of several weeks before the soil test results can be made available. The process has also been associated with variability in the depth and manner of soil collection. This has made the soil data collected using the conventional method less useful in supporting decision-making in the field of agriculture. To mitigate this problem, this research aims at the design and development of an autonomous soil spot sampling system that can collect and provide soil data in the field.The autonomous system for collecting and providing soil data in the field involves the development of a ground mobile platform that has control, environmental, and wireless communication modules. The autonomous system can move

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through the farming area and collect soil samples at designated points for analysis and determination of key soil parameters such as moisture content, pH, and nutrient content. The collected data can be processed and transmitted using the LoRa communication system, which can transfer data efficiently over long distances in the field where the system can be deployed effectively. The suggested system aims to reduce human error and the waste of fertilizers in agriculture by automating how soil data is collected and analyzed. Furthermore, the system could be expanded in the future to include more advanced features, such as data analysis and the creation of a digital twin. The proposed system can provide a scalable and cost-effective solution for the improvement of sustainable farming through the development of autonomous systems that can support decision-making in the field of agriculture.

116. SNAPSHOP: A COST-EFFICIENT RFID-BASED SELF-CHECKOUT SYSTEM FOR SCALABLE RETAIL AUTOMATION

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SnapShop is an RFID-based intelligent self-checkout system that revolutionizes the traditional shopping experience by eliminating cashier-mediated checkouts. The system integrates QR code scanning via a web application using HTML5-QRCode library with RFID technology for enhanced security and real-time inventory management. By allowing customers to scan products using their smartphones and automatically transfer ownership through a centralized database, SnapShop reduces waiting times, prevents theft through RFID-enabled exit gates, and provides valuable insights into consumer behavior. The implementation leverages cost-effective technologies including Node.js, MongoDB, and ESP32 microcontrollers with MFRC522 RFID readers. Testing with seven participants and four products demonstrated an average checkout time reduction to under 16 seconds with successful theft detection in controlled testing scenarios. The pro- posed system demonstrates significant improvements in checkout efficiency, customer satisfaction, and operational cost reduction, with production hardware costs of Rs. 25,000-43,000 per exit gate compared to Rs. 12,000 per smart cart in existing systems [8], requiring only 5 gates versus 50 carts for comparable capacity.

117. CARE: A CLINICALLY AWARE RARE-EVENT PREDICTION FRAMEWORK FOR SMALL-FOR-SIZE SYNDROME AFTER LIVING DONOR LIVER TRANSPLANTATION

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Small for Size Syndrome (SFSS) is a critical complication in adult liver transplantation, particularly in partial liver transplantation. SFSS is defined by the presence of liver dysfunction in the early postoperative period, including coagulopathy, cholestasis, and ascites. However, the reliability of the commonly used SFSS prediction factors, including the graft-to-recipient weight ratio, portal vein pressure, and ultrasound, may not be satisfactory due to the high variability among observers. These prediction factors are not able to consider multidimensional factors. Most studies on SFSS prediction are based on a small dataset with serious class imbalance. In order to address these issues, in this study, we propose a framework under the name CARE, specifically developed for imbalanced medical data. CARE consists of three submodules: Adaptive Clinical Sampling, which generates synthetic data that is physiologically valid, a Hierarchical Feature Interaction Network, and an Uncertainty-Weighted Ensemble. Using clinical data from 2019 to 2024, we have shown that CARE can yield improved external validation results with high balanced accuracy and sensitivity in predicting SFSS. Features related to cold ischemia time and feature interactions were found significant in predicting SFSS.

118. AL-DRIVEN DISEASE PREDICTION AND RECOMMENDATION FOR PLANTS AND CROPS

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Crop diseases significantly impact agricultural productivity and food security worldwide. Early and accurate detection of plant diseases is essential for minimizing crop loss and improving yield quality. This paper presents a lightweight Convolutional Neural Network (CNN)-based system for automated crop disease classification using leaf images. The proposed model is trained on the publicly available PlantVillage dataset containing 15 classes of healthy and diseased plant categories. To achieve computational efficiency suitable for low-resource environments, input images originally sized at 256×256 pixels are resized to 128×128 during training and inference. The system utilizes an 80–20 training- validation split and categorical cross-entropy loss for multi-class classification. Experimental results demonstrate that the proposed model achieves approximately 88–92% validation accuracy while maintaining reduced computational overhead. A Streamlit-based web interface enables real-time disease prediction along with cause analysis, recommended treatment, and preventive measures. The proposed approach provides a practical and deployable solution for precision agriculture applications.

119. DATA-DRIVEN BASED POWER QUALITY DISTURBANCE ANALYSIS FOR IMPROVED RELIABILITY IN SMART GRIDS

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Power quality disturbances (PQDs), including transients, interruptions, sags, swells, and flickers, pose significant challenges to the stability and reliability of modern electrical grids [1], [2]. These disturbances can cause equipment damage, production losses, and safety issues, making accurate and timely detection essential [3]. Traditional monitoring techniques based on threshold settings and manual analysis are often inadequate for real-time detection, particularly for short- duration events [5], [11]. This paper proposes an interpretable and deployable machine learning framework for PQD classification. The proposed approach utilizes statistical and wavelet-based feature extraction from voltage signals to identify multiple disturbance types. Various machine learning models are evaluated to analyze classification accuracy and computational efficiency for real-time implementation. Furthermore, a software architecture with fast inference capability and a user-friendly diagnostic interface is developed to enable continuous power quality monitoring. Experimental results demonstrate high accuracy in detecting critical disturbances, especially transients and interruptions. The proposed system provides a scalable, reliable, and efficient solution for automated PQ monitoring, enhancing the overall safety and performance of modern power systems [7], [8].

120. DISASTER ALERT SYSTEM USING GEOLOCATION

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With the rapid growth of urban populations and intensifying climate variability, building a dependable disaster warning infrastructure has become a critical societal priority. This paper presents a web-based Disaster Alert System that employs geolocation technology to deliver targeted, real-time warnings exclusively to individuals who fall within a configurable hazard proximity radius. Unlike conventional broadcast mechanisms that push undifferentiated notifications region-wide, the proposed system computes the Haversine distance between each users live coordinates and every active hazard record, issuing an alert only when that distance satisfies the threshold criterion. Hazard records capturing event type, severity classification, geographic coordinates, and timestamp are aggregated from open public

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datasets and curated simulated scenarios, then subjected to a rigorous three-stage preprocessing pipeline to eliminate duplicates, validate coordinates, and normalise timestamps. The cleansed dataset is persisted in a cloud-hosted database, enabling concurrent multi-user access with negligible query latency. A rule-based alert engine evaluates incoming proximity queries and dispatches severity-ranked notifications through an interactive web dashboard. Empirical evaluation across four disaster categories - flood, fire, earthquake, and road accident - yielded a mean alert accuracy of 93 percent and an average end-to-end latency under two seconds, validating the system as a practical, scalable foundation for community-level emergency preparedness.

121. STOCK MARKET TREND PREDICTION USING SENTIMENT ANALYSIS OF FINANCIAL NEWS HEADLINES WITH FINE-TUNED FINBERT AND LSTM

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The prediction of what stocks will do in the stock market is a daunting process since the macroeconomic events intersect with the industry or business specific news. In this paper, the researchers introduce a hybrid AI-based stock prediction algorithm that incorporates the financial news sentiment analysis and the deep learning-based time series modeling. The architecture proposed gives the combination of FinBERT as used to extract contextual finance sentiment and a PyTorch-based Long Short-Term Memory (LSTM) network to predict stock direction. A sentiment-weighted mechanism places high-impact news at the frontier whereas a sentiment correction layer decreases model bias during low prediction confidence situations. The system also includes automated news retrieval, multi-level impact model (macro, sector, and company), causal reasoning generation and real-market verification based on Yahoo Finance information. Empirical tests indicate that there is a higher correlation in the direction of both sentiment and predicted trend. The suggested framework offers an explanation, real-time and on-the-fly financial forecasting of large-cap stocks based on AI.

122. REAL-TIME SIGN TO SPEECH TRANSLATOR WITH CROSS LINGUAL VOICE OUTPUT

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Sign language is a major form of communication among the hearing and speech impaired people. Nevertheless, communication barriers occur where different languages are used or those communicating do not comprehend the sign language. In this paper, a real-time sign language recognition system that is able to translate a sign language into spoken words and additionally provides multilingual translation functions is presented. The system proposed incorporates computer vision, deep learning, and natural language speech synthesis to allow accessible and inclusive communication. The system uses OpenCV to acquire video streams in real-time and uses the hand landmark estimation of MediaPipe to determine the correct position of hand and extract regions of interest. A trained CNN model is used to classify the frequently used sign gestures, including Hello, Thank You, Yes, and No based on a labeled dataset of still sign gestures, and temporal averaging is used to improve predictive reliability in continuous real time gestures. The identified text is spoken by an offline text-to-speech engine and a multilingual translation layer allows the user to automatically translate the speech into other languages when necessary. The suggested system is offline and has a low latency hence applicable to real-time applications that involve assistive systems. The results of experiments prove that the model shows a good degree of accuracy in the chosen classes of gestures and is resistant to different background conditions. The mechanism is set to be made scalable to a wider set of signs and flexible to the various language settings. In general, the work leads to closing the communication gap in the speech and hearing disabled by providing a multilingual, low-cost, and real-time assistive communication device. This ability to add speech synthesis in more than one language makes the system both different to the current sign-to-speech converters and offers a scalable solution to be used both in educational and healthcare settings as well as in general population contexts.

123. HANDLING ETHICAL ISSUES IN DEEPFAKE TECHNOLOGY USING DEEP LEARNING TECHNIQUES THROUGH A REAL-TIME DETECTION WEBSITE

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The application of deepfake technology is one of the technologies that are driven by state-of-the-art deep learning algorithms and have at the same time spawned serious ethical issues including misinformation, identity theft, and invasion of privacy. In this paper, the author presents a real-time web-based detection system to identify and manage the deepfake content in an ethical and effective manner. The suggested architecture applies Convolutional Neural Networks (CNN) to extract visual features and Recurrent Neural Networks (RNN) to verify audio features as a multimodal way of authenticity validation. This system is created on the basis of Django, TensorFlow, and Librosa and allows users to post media, which is then run through the system to identify the probability of manipulation given the spatial and time differences. The consideration of ethics which includes the privacy of data, user consent, openness and fairness are integrated throughout the detection process to promote responsible use of AI. In totality, the system would be able to fight digital misinformation and maintain ethical standards and foster credible AI-based media validation.

124. COMPARATIVE ASSESSMENT OF MACHINE LEARNING ALGORITHMS FOR LANDSLIDE SUSCEPTIBILITY MAPPING IN THE NILGIRIS DISTRICT, WESTERN GHATS

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Mountainous terrains worldwide face recurring landslide hazards that devastate communities and destroy infras- tructure. We present a comparative study applying computational intelligence techniques to predict landslide-prone areas in the Nilgiris District, Tamil Nadu, located within the Western Ghats biodiversity hotspot. Our analysis contrasts three distinct algo- rithms: an ensemble

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decision tree approach using 300 trees with bootstrap sampling, an extreme gradient boosting framework with L1/L2 penalty terms, and a kernel-based classifier utiliz- ing radial basis functions. The tree-based ensemble generates predictions by aggregating votes from multiple classifiers while simultaneously computing variable importance rankings. The boosting method iteratively refines predictions through sequential error correction with built-in complexity controls. The ker- nel approach projects input features into higher dimensions to establish optimal class separation boundaries. Experimental results reveal that aggregated tree models consistently surpass single-classifier methods, with terrain steepness emerging as the most influential predictor. Our susceptibility maps effectively identify critical hazard zones across the study region, offering actionable intelligence for regional planning authorities and disaster preparedness initiatives.

125. MULTI DRUG-DRUG INTERACTION (MDDI) THROUGH SEQUENCE PARSING AND N-GRAM ANALYTICS

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Drug–drug interactions (DDIs) are a critical concern in healthcare, as the simultaneous use of multiple medications can lead to adverse effects and reduced therapeutic effectiveness. Traditional approaches often focus on bi-gram or tri-gram combinations, limiting their ability to capture complex multi-drug interactions. This work proposes a data- driven framework that extends this approach by generating flexible N-gram combinations to model both pairwise and multi-drug interaction patterns. A structured dataset from Drug Bank is preprocessed using Natural Language Processing (NLP) techniques, including text cleaning, tokenization, and lemmatization. A rule-based mechanism is then applied to identify interaction effects, followed by an aggregation strategy to classify severity levels into mild, moderate, and severe categories. The system provides clear and interpretable outputs, improving the understanding of drug interactions and supporting safer clinical decision- making.

126. COMPARATIVE ANALYSIS OF ZERO-SHOT AND FEW- SHOT PROMPTING FOR LEGAL DOCUMENT SUMMARIZATION USING LARGE LANGUAGE MODELS

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Anyone who has spent time wrestling with a lengthy legal document — a commercial contract, a regulatory filing, a court judgment stretching across fifty or a hundred pages — knows how quickly that exercise becomes an ordeal. The writing is deliberately dense. Legal terms carry meanings that bear little resemblance to their everyday counterparts. Sentences that appear straightforward on first pass turn out to be riddled with nested conditions that shift interpretation depending on punctuation. For those without legal training, the space between "I have read this document" and "I understand what this document actually requires of me" can be wide and genuinely costly. Even seasoned attorneys are not spared the burden of time — working through complex legal materials with the necessary care consumes hours, and as the volume of digital legal material continues to expand, those hours keep compounding.

127. A VISION-BASED SYSTEM OF POTHOLE DETECTION AND SEGREGATING FRAMEWORK OF ROAD ENVIRONMENTS IN LOW-BRIGHTNESS WITH INTELLIGENT SIGNALS

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Road infrastructure deterioration, especially the formation of potholes, greatly impacts on the vehicle safety, on- road comfort, and traffic performance in the metropolis, and the extent of the issue improves with low-lighting and nighttime driving conditions. The research paper proposed will present a superior pothole detection and segmentation system coupled with intelligent alert and reporting system to provide the dependable performance under varying lighting conditions. The implementation model of the research paper involves the use of YOLOv11 to identify the object in real-time with high speed and the use of an R-CNN based segmentation model to identify the boundary of the surface defects, with surface defects and accurate contour delineation. The issue of texture-oriented feature modeling improves the distinction between actual pothole areas and other road surface-based visual images with similar appearances through the application of Zero-Reference Deep Curve Estimation and Self-Calibrated illumination enhancement techniques to allow illumination normalisation without paired supervision. The implementation of the proposed research paper yields an overall detection rate of 96.42, segmentation IoU of 91.85 and night-time recall of 94.18 on mixed day night roadway data. The support of preventive maintenance planning and reduction of risks to the driver are supported by the dissemination of alerts in real-time and the transmission of defects that are geotagged. The results of the experiment prove the existence of significant performance improvement compared to the traditional

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CNN and baseline YOLO models, which supports the potential applicability to real-world settings of intelligent transportation and infrastructure monitoring.

128. SECUREPIX: STEGWARE DETECTION USING BETA-VARIATIONAL AUTOENCODER WITH DUAL ANOMALY SCORING

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The increasing use of digital images for commu- nication has enabled new forms of hidden malware, known as stegware, The embedding of malicious payloads within images. Detecting such threats is challenging because they introduce min- imal distortion and sneak past traditional security mechanisms. This paper presents SecurePix, a lightweight anomaly detection framework based solely on a Beta-Variational Autoencoder (- VAE). The model is trained exclusively on clean CAPTCHA images to learn the distribution of normal data. During inference, anomalies are detected using a dual scoring mechanism that com- bines reconstruction error and latent space deviation. A statistical thresholding approach is employed to distinguish between normal and anomalous samples. The proposed method is evaluated on a dataset of grayscale CAPTCHA images embedded with multiple steganographic techniques, including LSB, PPM, and parity-based encoding. The results demonstrate strong detection performance, high generalization capability, and robustness . The simple architecture improves training stability and reduces computation load , making it suitable for real-time deployment in practical cybersecurity applications.

129. REAL-TIME MULTIMODAL INTRUSION DETECTION ON RASPBERRY PI USING YOLOV4-TINY FOR MILITARY BORDER SURVEILLANCE

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Real-time detection of security threats on resource constrained embedded devices remains a practical challenge for modern surveillance systems. The proposed system employs the lightweight YOLOv4-Tiny model on a Raspberry Pi to perform on device visual detection of potential threats, including persons, vehicles, drones, weapons, fire, and smoke from live video streams. Local processing reduces latency and eliminates dependence on cloud connectivity, this enables efficient edge- based monitoring. To improve coherence under visually challenging conditions, an additional audio-based weapon firing detection module using feature extraction and Support Vector Machine classification is unified with the visual pipeline. The combined visual audio framework enhances situational awareness also maintaining low computational and power requirements suitable for under-resourced environments. Experimental evaluation demonstrates reliable real time detection across varied inferential conditions, indicating the feasibility of installing deep learning based intrusion monitoring on embedded systems. The system supports applications in border security, industrial safety, and smart city surveillance through a scalable and cost-efficient design.

130. AI-DRIVEN HEALTH ANALYTICS FOR CERTIFICATION OF REUSABLE LAUNCH VEHICLE AVIONICS

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With commercial reusable launch vehicles (RLVs) moving toward high-cadence operations, certifying recovered avionics hardware for reflight has become a pressing engineering challenge. Traditional qualification frameworks rely on conser- vative component cycle limits that leave substantial reuse value unrealised and provide no mechanism for detecting components degrading faster than expected. This paper presents an end-to- end AI-driven health analytics framework that replaces the cycle- count paradigm with condition-based assessment. Raw telemetry from four sensor modalities is processed into a 17-feature health representation, passed through a two-stage machine-learning pipeline Isolation. Forest anomaly scoring followed by XGBoost classification and converted into an explainable three-

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class cer- tification recommendation (Fit for Reflight / Inspect & Repair / Retire) with a continuous health score and SHAP-based feature attribution. Evaluated on a 1,200-record physics-informed synthetic dataset, the framework achieves 93.7 % overall accuracy, an F1 of 0.96 on the reflight class, and a zero rate of incorrectly certifying a retirement-class component for reflight. A human- factors study (n = 12 engineers) confirms that SHAP attribution significantly improves trust calibration and error-override rates.

131. LUNG CANCER DETECTION AND STAGE CLASSIFICATION USING DENSENET-169 ARCHITECTURE

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The pulmonary cancer remains one of the leading causes of cancer related death in the entire world hence the need to have highly accurate and fully automated diagnostic system. The subjectivity, the variability in the observations of the observers and the growing dependency of the traditional histopathological examination on the interpretation of experts are also the weaknesses of the traditional analysis that was a long-established part of the clinical workflow. To counter these issues, this paper will suggest a deep learning-based classification framework that is composed only of the DenseNet169 to detect lung cancer at a higher degree. This high-connectivity scheme of DenseNet169 makes interesting gradient propagation and heavy re-use of diagnostically valuable features possible and thus facilitates the network to identify subtle structural and textural patterns inherent in microscopic lung tissue images. The average (balanced) dataset of 15,000 histopathological lung images that the model is trained on consists of three categories: Lung Adenocarcinoma (LUAD), Lung Benign Tissue (LUBEN) and Lung Squamous Cell Carcinoma (LUSC). Significant augmenting and pre- processing were done to improve variety and strength of the training set. As measured experimentally, the DenseNet169 based framework obtains a high accuracy of classification at 93-95 percent, which is better than a number of baseline CNN architectures, including VGGNet-16, Google Net, and EfficientNet-B6. These results underscore the fact that deep residual feature recognition works well at identifying intricate cellular fashions and indicates that DenseNet169 can be a dependable computational system in enhancing the precision and dependability of lung cancer examination in clinical practice.

132. ON-ROAD EMISSION ANALYZER WITH CERTIFICATION SYSTEM

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The project on-road emission analyzer designed to measure real-time exhaust pollutants from moving vehicles using high-precision gas sensors. The system captures key gases such as CO, CO_2, HC, and NOx with improved accuracy through an embedded microcontroller-based data acquisition unit.A wireless communication module transfers the collected data to a central monitoring platform for further analysis. The device enables quick, non-intrusive testing of vehicles under real driving conditions, unlike traditional stationary emission tests. Advanced algorithms validate the measured values against pollution control norms to determine compliance. If the vehicle meets the standards, the system automatically generates a digital emission certificate.

133. A HYBRID LEARNING AND RECALIBRATING MULTIVARIATE TIME SERIES CLASSIFICATION USING SPECTRAL-TEMPORAL FUSION NETWORK

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Multivariate time series have found application in biomedical surveillance, industry sensorimotor forecasting, and finance as well as the environmental setting that effective classification is anticipated in line with synchronization and inter-channel in a better unified model in the fashion of andragogy, unlike independent and unrelated modelling. Traditional Convolutional Neural Networks (CNNs) are able to provide good time features yet they fail to extract spectral properties and dynamic channel interactions. In this paper, a Spectral-Temporal Fusion Network (STFN) is introduced as the Hybrid Learning and Recalibrating framework. The model integrates the extraction of temporal features with spectral representations by Discrete Cosine Transform (DCT) and Short Time Fourier Transform (STFT) branch. The Energy- Adaptive Coefficient Optimization mechanism is a dynamically selection mechanism of informative frequency components using differentiable spectral masking. A Cross-Frequency Channel Attention net comprises attentions of spectral bands, and Temporal Self-Attention block represents the long-range dependency on a temporal scale. Multivariate time series data experimental testing demonstrates that the given model is capable of reaching a classification rate of 94.3% being more effective than Efficient Channel Attention (91.2%) and Squeeze-and-Excitation (89.8%). The model is also 12.6% less computationally demanding and has better generalization. These

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findings indicate that multivariate time series analysis involving spectral and temporal learning with adaptive attention enhance classification in multivariate time series analysis.

134. VISION-BASED DRIVER DROWSINESS MONITORING USING YOLOV8

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Driver drowsiness is one of the critical factors in road accidents, especially during night time under conditions of low visibility. The current work proposes an approach to real-time driver drowsiness recognition using spatio-temporal deep learning without any invasive sensors. The proposed system combines a modular architecture in which the process of extracting spatiotemporal features is divided into the spatial unit, which automatically assesses each frame for any visual clues, such as yawning or closed eyes, and a temporal unit, which assesses variations in behaviour over time. The video frames captured by the driver-facing camera combine with the pre-trained YOLOv8 model for the detection and labelling of facial states such as "eyes open" or "yawning". These individual features then proceed to a Long Short- Term Memory network that analyses temporal patterns, differentiating usual and extended closures of the eyes as indicative of drowsiness. The final output presents the probability of the driver's being sleepy and triggers an alarm when it exceeds a threshold set on the probability value. The proposed system is trained and tested on a night-vision drowsiness dataset. Data augmentation is also incorporated to make it much more robust for different night-time driving conditions. It will keep precision, recall, and accuracy high for any real-time application. Integrating YOLOv8 with the LSTM network in turn helps in efficient monitoring of drowsiness, offering an excellent balance between speed and accuracy in low-light conditions. Overall, this research represents an intelligent, non-obtrusive driver monitoring system using deep learning approaches.

135. LEVERAGING FINANCIAL INFRASTRUCTURE FOR DECENTRALIZED POLLING: A DUAL-MODE ATM FRAMEWORK FOR MIGRANT VOTING IN INDIA

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India's democratic system is confronted with a crucial logistical conundrum: although it successfully holds the biggest election in the world, internal mobility causes a sizable section of its voters to be systematically denied the right to vote. According to data from the 2019 General Election, domestic migration was identified by the Election Commission of India (ECI) as the main reason why nearly 300 million registered voters did not cast ballots. It is not financially feasible to expand physical polling infrastructure in order to monitor this floating population. In order to address this issue, this paper suggests a Dual-Use Infrastructure Framework that transforms the safe network of more than 135,000 Public Sector Bank (PSB) Automated Teller Machines (ATMs) into polling places with biometric capabilities. We present a new "State-Switching Protocol" that uses the National Financial Switch (NFS) to switch government- owned ATMs between Financial Mode and Electoral Mode. We use a Federated Double-Blind Hashing Architecture, which mathematically separates the Identity Provider (Bank) from the Election Authority (Blockchain), to stop the banking partner from linking identity and vote. The system, which is based on a lightweight Proof-of-Authority (PoA) ledger, guarantees un-changeable audit trails and does away with gas fees. According to benchmarking, our cryptographic primitive has a latency of ≈ 5 µs, which is 10 5 times faster than conventional Zero- Knowledge Proof (ZKP) systems. This low-latency, sovereign architecture facilitates high-concurrency elections and serves as a safe technological foundation for the "One Nation, One Election" campaign.

136. DESIGN AND IMPLEMENTATION OF A SMART TELEPRESENCE ROBOT WITH RASPBERRY PI FOR REMOTE SURVEILLANCE

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In today's rapidly evolving technological landscape, the need for intelligent robotic systems that can operate in inaccessible, hazardous, or remote environments has become increasingly critical. This project proposes the development of a smart telepresence robot that bridges the gap between physical presence and remote interaction. By integrating real-time surveillance, immersive VR-based monitoring, and autonomous mobility, the system offers a versatile solution for applications such as security, research, and remote learning. The use of a Raspberry Pi platform powered by the RP2040 chip featuring a dual-core ARM Cortex-M0+ processor ensures a compact, cost-effective, and programmable foundation, while the custom-built mobile application enhances user control and flexibility. This project not only demonstrates practical engineering skills but also contributes to the growing field of human-robot interaction, making it a valuable tool for future innovations in robotics,

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IoT, and education. The proposed robot is designed to navigate autonomously along a predefined track with strategically placed breakpoints. A mobile application developed using MIT App Inventor allows users to select a breakpoint via Wi-Fi, prompting the robot to move and halt precisely at the chosen location. At each breakpoint, an IoT-enabled camera mounted on the robot chassis initiates live video streaming, which is monitored through a VR headset for immersive telepresence. This dual-mode operation via autonomous movement and semi-autonomous surveillance enables deployment in environments where human access is limited or unsafe. The system's modular architecture supports future scalability, including sensor integration, edge computing, and AI-based decision-making. By leveraging open-source tools and low-cost hardware, the robot is well-suited for academic research, prototyping, and real-world applications in remote monitoring and intelligent automation.

137. ENERGY PREDICTION USING GPU-ACCELERATED DEEP LEARNING FOR SMART BUILDINGS

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Energy consumption forecasting in smart buildings is a critical challenge owing to the dynamic, non-linear nature of energy usage patterns driven by IoT devices, HVAC systems, and environmental factors. Traditional static models are inadequate for real-time prediction under these conditions. This paper proposes a GPU-accelerated deep learning framework leveraging Long Short-Term Memory (LSTM) networks for accurate, real- time energy consumption prediction in smart buildings. The system is trained on the ASHRAE Great Energy Predictor III dataset, incorporating multi-dimensional time-series features encompassing electricity usage, weather conditions, and building metadata. GPU acceleration via Google Colab reduces training time by approximately 10× compared to CPU-only baselines while maintaining high prediction accuracy. Performance is evaluated using Root Mean Square Error (RMSE), Mean Ab- solute Error (MAE), and the coefficient of determination R 2 . Results demonstrate that the proposed LSTM model achieves RMSE = 0.0387, MAE = 0.0291, and R 2 = 0.923, outperforming linear regression, random forest, and vanilla RNN baselines. The framework supports sustainable energy management and smart city infrastructure goals aligned with UN Sustainable Development Goals (SDG 7, SDG 9, and SDG 11).

138. EVIT-DR: A LIGHTWEIGHT EFFICIENTNET–VISION TRANSFORMER FRAMEWORK FOR EXPLAINABLE DIABETIC RETINOPATHY CLASSIFICATION

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Grading diabetic retinopathy from color fundus images is pretty tough. There are these subtle lesion patterns that are hard to spot, plus a big imbalance in how many examples there are for each severity level. And decisions need to make sense clinically, you know, interpretable ones. This paper comes up with EViT-DR. Its a lightweight hybrid deep learning setup. It mixes an EfficientNet-B0 convolutional backbone, which is like the main part for local stuff, with a small Vision Transformer branch. And theres this lesion-aware soft attention module too. All for classifying DR into five classes automatically. The CNN part pulls out fine details on things like microaneurysms, hemorrhages, exudates, and weird vascular issues. It seems the Transformer handles the bigger picture, using non-overlapping patches of the image for global retinal context. I think that makes sense, local plus global. Then a compact attention fusion head puts those representations together. For training, they use class-weighted categorical cross-entropy to deal with the imbalance in the data. That part gets a bit messy, but it helps. They test it on public datasets, DDR and APTOS 2019. With a stratified 80/20 split for train-test, and some standard preprocessing plus data augmentation. Results look good, around 97 to 98 percent overall accuracy on the combined test set. Weighted F1-score is high too. It beats out standalone EfficientNet-B0, Xception, and DenseNet201, all trained the same way. And it only has about 5.4 million parameters, which is nice for places with limited resources. Grad-CAM visualizations show it focusing on the right lesion areas consistently. That stands out, I guess, for being interpretable in screening workflows. Potential as a decision tool, though im not totally sure how it fits everywhere.

139. HAND GESTURE RECOGNITION AND PREDICTION FOR ACCESSIBLE COMMUNICATION POWERED BY DEEP LEARNING AND COMPUTER VISION

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Millions of Deaf and Hard-of-Hearing (DHH) individuals continue to face real, day-to-day communication barriers simply because the people around them do not understand sign language. This paper presents a real-time ASL gesture recognition and sentence generation system designed to close that gap in a practical, low-cost way. The system captures live video through a standard webcam, extracts 21 three-dimensional hand landmarks per frame using Google's MediaPipe framework [21],

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and feeds normalized skeletal representations into a MobileNetV2- based convolutional neural network [5] trained on a purpose-built dataset of approximately 30,000 hand gesture images spanning 30 ASL signs. The dataset was assembled with deliberate variation in subjects, skin tones, lighting conditions, and backgrounds to ensure real-world generalization [9][30]. Training employed a two-phase transfer learning approach: the custom classification head was first trained on the frozen MobileNetV2 backbone, followed by fine-tuning of the top 30 backbone layers with a reduced learning rate. Beyond letter prediction, the system integrates an auto sentence completion module using n-gram language modeling [24][26] to suggest and complete words in real time as gestures are assembled into sentences, significantly reducing the gesture burden of letter-by-letter ASL spelling. A Flask web application provides a cross- platform browser interface requiring no additional software. Evaluation confirms 99.2% test-set classification accuracy, per-class F1 scores above 0.98 for 26 of 30 gesture classes, an average inference latency of 38 milliseconds on a consumer Intel Core i5 laptop without GPU acceleration, and a 34% reduction in total gesture counts enabled by the sentence completion module. The resulting prototype demonstrates that high-accuracy, low-latency sign language recognition is achievable on consumer-grade hardware, offering a credible foundation for scalable, human-centered accessibility technology.

140. A PERSONALIZED AI SYSTEM FOR INGREDIENT RISK DETECTION IN PACKAGED FOOD PRODUCTS

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The increasing consumption of packaged foods and the rising incidence of lifestyle related disorders such as diabetes, hypertension, obesity, and food allergies have created a need for intelligent tools that can interpret food labels and provide personalized dietary guidance. Existing food analysis applications typically rely on either barcode based product lookup or optical character recognition (OCR) of packaging text, each with inherent limitations including incomplete database coverage, sensitivity to label variability, and lack of comprehensive personalization. This paper presents a fully implemented Artificial Intelligence driven system that integrates barcode scanning, OCR based ingredient extraction, and user specific health profiling to deliver real time ingredient safety analysis and personalized nutritional assessment. The proposed system uses a hybrid data ingestion pipeline capable of processing both structured product data and unstructured label images. When barcode information is unavailable or insufficient, the OCR module extracts ingredient and nutritional details directly from packaging. A knowledge driven ingredient safety engine evaluates these components against a curated database of allergens, additives, and condition specific risk factors. The system further incorporates detailed user profiles including medical conditions, allergies, and dietary preferences to generate context aware

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recommendations. A macronutrient analysis module assesses key nutritional parameters relative to recommended intake levels, while a personalized verdict module produces clear guidance such as “Safe,” “Caution,” or “Avoid,” along with explanatory feedback. Designed for real time use and broad market applicability, the hybrid framework improves coverage, interpretability, and decision relevance compared to single method solutions. The system demonstrates how multimodal analysis combined with personalized health awareness can support informed consumer choices and contribute to digital health empowerment.

141. AUTOMATED CLASSIFICATION OF TRADITIONAL INDIAN PAINTING STYLES USING A HYBRID DEEP LEARNING APPROACH

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Keeping cultural records alive through digital means matters today. From India, styles like Warli, Madhubani, Gond, and Kerala Mural show unique shapes, colors, along with patterned designs. Still, sorting them by machine is hard - shapes often look too much alike, while labeled images in big numbers do not exist. Instead of relying only on standard models, this work combines learned features from neural networks together with manually built image traits for better recognition accuracy. One path begins with a fixed ResNet18 model generating a 512-value representation. Afterward, numerical traits - seven in total - are calculated by rule-based methods, describing aspects such as color spread, line concentration, balance patterns, and surface complexity. These two streams merge before entering a multi-layer network trained to assign categories. Testing occurred using about 924 pictures divided into eight artistic traditions. Performance reached approximately 79.0% correct identifica- tion during evaluation rounds. For comparison, a standard convolutional setup scored 78.0%. When examined per group, gains appear clearest among forms marked by vivid hues, including Kerala Mural and Madhubani expressions. Confusion remains between shapes-driven folk types such as Warli and Mandana, due to shared layout rules. Instead of replacing learned models, structured inputs support

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decision logic where samples are limited. Results suggest combining engineered signals with deep learning improves clarity and precision within small-scale heritage datasets.

142. AI-POWERED JOB RECOMMENDATION PLATFORM

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The lightning-paced development of online reclama- tion websites has augmented the necessity of clever mechanisms that are capable of directly relating campaigners with appropri- ate employment spots. The manner in which traditional keyword- based filtering is often applied causes skill mismatch, excessive webbing time and lack of personalization. The paper proposes an AI-based Job Recommendation Platform, including natural language process, motor- grounded semantic model, and cold- blooded recommendation means to achieve a better employment matching effectiveness. The system examines job descriptions and resumes, extracts regularized chops and produces vectors of representations based on contextual embeddings. A mixed machine that is a hybrid between the similarity of content and cooperation factors is used to rank job openings based on the capabilities of a seeker, experience, and preferences. A explainability module gives clear logic of recommendations. The experimental analysis indicates that the recommended method is better than the Keyword and stand-alone models in Precision, Recall, and NDCG and is able to process cold- launch scripts. The site promotes scaled, unbiased, and data-driven reclamation, assisting job campaigners and companies with precise and personalized job proposals.

143. LOW-POWER APPROXIMATE MULTIPLIER WITH CLOCK GATING AND HYBRID BOOTH ENCODING FOR ERROR TOLERANT IMAGE ANALYSIS

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Approximate computing improves the efficiency of digital circuits by intentionally relaxing computational accuracy in applications where minor errors are acceptable. This concept is widely applied in arithmetic units such as multipliers to achieve better performance. It uses different types of compressors at different levels. The main goal is to use less space and power while keeping the accuracy acceptable. Approximate arithmetic is used to help improve how well these circuits work. Compressors are often used in parallel multipliers to speed up the process of adding up partial products. The proposed architecture adopts a significance-driven approach where compressor selection varies across bit positions, enabling power reduction while maintaining acceptable computational precision. Second, compressors for less important weights are less accurate and use Booth encoding. A parallel prefix adder is applied on the end to make the multiplier faster. The last stage is a Kogge- Stone parallel prefix adder that is developed to minimize propagation delay to give better speed performance at the cost of extra hardware consumption. Kogge-Stone adder is faster and fewer gates are required than other adders. It also has the lowest area delay product (ADP) and power-delay product (PDP). Compared to the exact and the another approximate multipliers, this new design uses less power and has a high degree of accuracy. The performance and test results show that the multiplier has enough accuracy for applications that can handle some errors.

144. PRIVACY-FIRST TERRAFORM SECURITY: BENCHMARKING LOCAL LLM VIABILITY IN AN AGENTIC RAG FRAMEWORK

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This study investigates the viability of using local LLMs for Terraform template security validation to mitigate the privacy concerns associated with utilizing cloud based LLMs, and benchmarks their performance against them on consumer grade hardware. It compares seven local models - Qwen 2.5-Coder 7B, LLaMA 3.1 8B, DeepSeek-R1 8B, Gemma 3 12B, Mistral- Nemo 12B, Qwen 2.5 14B and DeepSeek-R1 14B against two cloud hosted models - GPT-4.1 and GPT-5.2. It uses an agentic approach with RAG retrieval techniques to optimize the outputs provided by the LLMs. The findings demonstrate that a locally deployed model, DeepSeek-R1 8B, achieved the highest F1 score (86.67%) among all evaluated models, including the cloud-hosted variants, establishing that privacy-preserving local inference can match or exceed cloud model performance for infrastructure security validation, albeit with increased latency.

145. ECOTRACK: INTEGRATING HABIT TRACKING AND REAL-TIME AIR QUALITY MONITORING FOR SUSTAINABLE LIVING

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EcoTrack is an intelligent web-based application created to promote sustainable lifestyles by combining eco-friendly habit tracking with live air quality monitoring. The platform monitors everyday activities such as walking, recycling, and saving electricity, and evaluates them together with local environmental indicators like the Air Quality Index (AQI), particulate matter levels, and different gaseous pollutants. By connecting individual habits with real-time environmental data, EcoTrack helps users understand their sustainability impact and offers practical suggestions along with personalized feedback. The system operates through a secure and structured process that includes user authentication, collection of habit-related data, retrieval of real- time air quality information, calculation of gamified sustainability scores, and visual representation of results. To maintain user interest and encourage consistent participation, EcoTrack integrates motivational elements such as eco-points, achievement badges, streak tracking, and leaderboards. These gamification features support long-term engagement and habit formation. The application is developed using React.js for the front-end interface and Firebase for backend services and authentication. Testing results indicate increased user involvement, steady adoption of eco-friendly habits, secure system performance, and minimal response delays.

146. AI-DRIVEN SPECTRAL-SPATIAL FEATURE FUSION FOR SMART AGRICULTURAL LAND CLASSIFICATION

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Accurate land-cover mapping is essential for modern smart farming. However, classifying complex agricultural landscapes from hyperspectral data is difficult when looking at spectral and spatial cues separately. This paper presents SSFNet, a two-branch deep learning model that uses a transformer encoder for spectral processing and a graph attention network (GAT) for spatial reasoning. It combines both parts through a channel-wise adaptive fusion method. The design was tested on the Indian Pines and Pavia University hyperspectral datasets, achieving an overall classification accuracy of 90%. Attention visualizations show that the model identifies important spectral features, such as near-infrared reflectance edges and chlorophyll absorption characteristics, without any explicit spectral guidance. By basing each design choice on AI and sustainable farming needs, SSFNet aims for practical use in airborne and UAV-based precision agriculture systems. The results indicate that adaptive fusion, which adjusts the weight given to spectral and spatial information for each input patch, consistently outperforms single-branch methods and fixed fusion approaches across various agricultural scenes. The architecture is easy to understand, computationally efficient compared to its accuracy improvements, and suitable for expanding into multi-temporal and edge-deployed smart farming uses.

147. AIOPS-DRIVEN DEVOPS PIPELINE FOR PREDICTIVE DEPLOYMENT RISK SCORING, ANOMALY DETECTION AND AUTOMATED DOWNTIME REDUCTION IN CI/CD ENVIRONMENTS

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The modern DevOps systems retain huge amounts of diverse operational data in the form of code repositories, CI/CD pipelines, and production systems. It is evident that software deployment failures and issues occurred post deployment are still hard to predict and avoid in advance despite such huge data availability. Post-Deployment failures will cause increased delay in downtime recovery and larger scale of operational costs. Existing researches are deficient in forecasting the deployment risk along with detecting the anomalies occurring in production and automating the remediation actions as a combined intelligent system framework. This study researches an AIOps-driven smart framework which combines all the three components such as predictive deployment risk assessment, real-time anomaly detection, and automated remediation into an integrated operational pipeline. This intelligent framework leverages the Machine learning algorithms such as XGBoost which is a supervised combined model for predicting the pre-deployment risk using commit-level metadata, build history and test results as primary parameters and Auto- encoders which is an unsupervised deep learning model for detecting whether anomaly occurs during the post deployment phase. It integrates the unsupervised autoencoder-based anomaly detection model working as a recurring runtime monitoring system by identifying deviations in application logs and system performance metrics with a supervised Random Forest algorithm for classifying the severity to predict the levels (P0-P3) enhancing automated actions. This integrated model is evaluated by calculating the performance metrics such as accuracy, precision, recall, F1-score and confusion matrix to achieve an efficient way to balance predictive reliability in transparent operations. While validating the proposed system, it is clear that the outcome of the study provides a proactive prediction whether the system will fail after the deployment or not. Incident

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reduction can be achieved and significant minimization of the mean time to recovery (MTTR) using automated response mechanisms. The observations highlight that the implementation of an integrated AIOps framework significantly improves the efficient decision- making in DevOps pipeline, improves system stability and boosts the overall reliability within CI/CD environments.

148. MACHINE LEARNING-BASED FRAUD DETECTION SYSTEM FOR REAL-TIME FINANCIAL TRANSACTIONS

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Financial fraud has become very serious problem in the digital economy with increasing online transactions and electronic payment systems. Most of the time, these automated rule based fraud detection mechanisms are unable to detect the latest fraud patterns and tricks used by criminals. This paper presents a Machine Learning Based Fraud Detection System that utilizes supervised learning algorithms to identify suspicious financial transactions instantaneously. The proposed framework integrates data preprocessing steps such as normalization, feature engineering, and solving the class imbalance problem by SMOTE. Various machine learning models including Logistic Regression, Random Forest, Support Vector Machine, and XGBoost are trained and evaluated based on their results from accuracy, precision, recall, F1 score, and ROC-AUC metrics. The experi- mental results indicate that ensemble based models significantly outperform the traditional classifiers by not only obtaining higher detection accuracy but also reducing false positives. The system is scalable, adaptable, and capable of acquiring knowledge about changing fraud patterns thus, it can be easily integrated into banking and digital payment infrastructures. The research shows how efficient data-driven intelligent systems are in providing financial security and cutting down the economic loss caused by fraud.

149. A SECURE SOFTWARE-BASED MULTI-LAYER LAB SECURITY SYSTEM INTEGRATING FACIAL BIOMETRICS, FINGERPRINT AUTHENTICATION, AND TIME-SYNCHRONIZED OTP MECHANISMS

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The suggested system offers a secure multi- layer laboratory access system that incorporates facial biometrics, a fingerprint verification system, and a time- synchronized OTP system. The framework counters the rising speculations about the unauthorized intrusion into the laboratories by inculcating a rigid sequence of authentication processes where face recognition: first, then hardware-based fingerprint verification, and finally, OTP verification through the GSM-based SMS delivery. The system captures all the access attempts and logs time stamps which makes it accountable and allows real time monitoring. Attempts to do so that ultimately result in failure would initiate instant alerts that would discourage intrusion and aid in constant monitoring. The solution is designed to be very reliable even with low connectivity conditions by combining a few hardware with a software-oriented architecture. Testing shows that the system can authenticate seriously, increase its access control accuracy, and increase operational security, which is why it is applicable to sensitive laboratory settings and multilayer verification is needed.

150. RURAL CARE MEDIBOT: AN IOT-DRIVEN AUTONOMOUS HEALTHCARE ASSISTANT FOR REMOTE HOSPITALS

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Rural hospitals often struggle with patient monitoring because they do not have enough medical staff, and their systems are not equipped for continuous monitoring. The healthcare system faces two major challenges because it does not provide timely patient monitoring. Through Internet of Things (IoT) and

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robotics technologies automated monitoring systems now enable healthcare organizations to create remote communication systems. This paper presents Rural Care MediBot an IoT- based autonomous healthcare assistant which enhances patient monitoring systems for hospitals located in remote areas. The system uses a mobile robotic platform which combines various health monitoring devices that measure heart rate and oxygen saturation (SpO_2) and temperature. The Arduino Uno microcontroller controls all system operations while it tracks information from multiple sensors. The ESP8266 Wi-Fi module enables users to track their health through remote access to cloud monitoring services. The robot navigates its environment by using ultrasonic sensors which help it sense obstacles. The ESP32 CAM module provides doctors with remote visual monitoring tools that enable them to watch their patients. Medical professionals can monitor vital signs through the system which transfers health data to a cloud platform. The system enables patients to transmit basic messages to doctors through a keypad interface which they can use to send messages. The system employs robotics and IoT technology together with continuous health monitoring to lower healthcare staff work demands while improving medical support availability in rural hospitals.

151. BEYOND ACCURACY: INTERPRETABLE STEGWARE CLASSIFICATION USING HYBRID NEURAL NETWORKS AND GRAD-CAM

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A Stegware is a benign digital media embedded with a malicious payload which is undetectable by superficial scanning. These payloads are usually viruses, trojans or ransomware that infects computers, encrypts files, and locks systems, making data inaccessible to users. In our previous research, we proposed a deep learning based solution for detecting Stegware. In that research, CNN achieved the highest baseline accuracy (0.512). In this research we try to improve upon the base line CNN architecture by adding additional layers, comparing and interpreting the results using Grad-CAM visualization.

152. FINSAKHI: A MULTILINGUAL INTELLIGENT FINANCIAL ADVISOR FOR LOAN ELIGIBILITY AND FRAUD PREVENTION

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Due to low financial literacy, limited access to trustworthy advisory systems, and a lack of regional language support in current digital platforms, people living in rural and semi-urban areas have a difficult time managing their financial affairs. The majority of financial applications are inaccessible to people with low literacy levels or little exposure to technology because they are made for English-speaking, digitally literate users. Users struggle to comprehend loan eligibility requirements, repayment plans, and related financial risks, which leads to bad financial choices and fraudulent schemes.In order to improve financial accessibility, it offers a multilingual AI-based financial risk assessment and advisory system. The suggested system incorporates Natural Language Processing to facilitate voice-to-text and multilingual communication. In order to address class imbalance, it uses machine learning models, such as a Random Forest classifier trained on a credit card fraud detection dataset using the Synthetic Minority Over- sampling Technique. Additionally, the system uses Optical Character Recognition (OCR) to automatically extract financial information from documents.In addition, a hybrid risk assessment engine is presented to analyze agreement-based and financial risks, producing a thorough risk score and suggestions. By encouraging financial inclusion and transparency, the suggested system supports SDGs 8 (Decent Work and Economic Growth) and 9 (Industry, Innovation, and Infrastructure).

153. ECORESONANCEAI: A REAL-TIME ENVIRONMENTAL RISK MONITORING SYSTEM USING MULTI-SOURCE DATA

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There is a growing need for smart and real-time monitoring systems because of the increasing occurrence of floods, earthquakes, extreme weather conditions and other natural disasters. Traditional models do poor predictions due to a single-source data-driven and significant disjunction between environmental features and models itself. The proposed system is called EcoResonanceAI which is basically a multi-source data-driven Environmental hazard risk predictions framework using Convolutional Neural Network (CNN) with Long Short-Term Memory (LSTM) model. The suggested methodology gives the incorporation of heterogeneous pattern of environmental data in the integrated development system. The data should consist of atmospheric, hydrological and seismic parameters.

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Data will be collected from public datasets like NASA POWER and USGS data repositories. Additionally, the stress on the ecological system as a whole and its component parts is measured through.The model integrates a CNN with an LSTM to effectively capture and analyse spatio-temporal features. The CNN is intended to learn the spatial features from the dataset while the LSTM is intended to learn the temporal dependencies. Through the experimental results, we can evaluate that the architecture proposed is better than Support Vector Machine and Random Forest. The model successfully attains.The effectiveness of our approach for multi-hazard prediction and environmental risk assessment applications is validated through these results. This can be used for disaster management, smart environmental monitoring and early warning systems.

154. PERFORMANCE EVALUATION OF BACTERIAL CONCRETE INCORPORATING BANANA STEM ASH FOR SUSTAINABLE CONSTRUCTION

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Concrete structures are commonly prone to development of cracks which often negatively affect the durability and the longevity of the structure. Self-healing concrete is a new technology developed in order to restore the structural stability and the functionality of the structure by using biological methods to heal cracks. In this study, a hybrid bacterial self-healing concrete is developed by using Bacillus subtilis bacteria and banana stem ash. Bacteria in the concrete specimen cause the formation of calcium carbonate by biochemical reaction that acts as a plaster filling the micro-cracks while banana stem ash acts as a substitute for cement with the aid of strong pozzolanic reaction. For this purpose, bacterial solution, banana stem ash and control specimens are mixed in various proportions and compressive strength, split tensile strength, flexural strength and slump values of the fresh concrete specimens are investigated. Specimens are kept for curing for 7, 14 and 28 days and compressive strength of the specimens are applied using compression testing machine. According to test results, the strength of self-healing concrete is increased as well as the sustainability of the concrete which is improved. In addition, the application of agricultural waste on concrete structure increases the sustainability of structures by reducing harmful effects to the environment.

155. SMARTVERIFY: INTELLIGENT AND VERIFIED SERVICE PROVIDER USING LEARNING TECHNIQUES

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The rapid expansion of digital platforms has transformed how people access services such as home maintenance, technical support, healthcare, and education. However, many online service platforms lack reliable verification mechanisms for service providers, which often results in fraudulent profiles, identity misuse, and reduced user trust. This research presents SmartVerify, an intelligent service provider verification system that integrates Artificial Intelligence (AI), Machine Learning (ML), and Computer Vision (CV) to authenticate service providers before they are allowed to offer services on the platform. The system verifies identity documents and performs facial recognition to detect fraudulent registrations. The proposed platform is implemented using the MERN stack (MongoDB, Express.js, React.js, Node.js), providing a scalable and responsive web environment. The system also incorporates an AI-based chatbot to assist users in navigating services and verifying provider status. Experimental evaluation shows that the verification module achieves approximately 95–96% accuracy, while the chatbot achieves around 90–92% response accuracy. The SmartVerify platform is particularly beneficial for rural and semi-urban areas, where access to verified service providers is limited. By integrating intelligent verification mechanisms and scalable web technologies, the proposed system contributes to building a secure, transparent, and trustworthy digital service marketplace.

156. PERFORMANCE INTELLIGENCE MODEL FOR CRICKET PLAYER ASSESSMENT AND STRATEGY PLANNING

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Cricket is an analytical sport because the performance is determined by facts and figures. This paper is on a perspective of analyzing player performance in cricket referred to as the Performance Intelligence Model of Player Assessment and strategy Planning in Cricket. This model examines historical match data, socioeconomic data of players and player results. The model goes through some steps to ensure that the numbers are right, to obtain the clean data. Data cleaning, feature engineering and normalization are among the data preprocessing methods that it utilizes to identify patterns in the numbers it uses. ML techniques, such as linear regression, decision trees models and random forest algorithms were used to predict performance patterns and outcomes. Each player has the option of making a good decision such as which player is to be on the team, what order to bat in and what bowling strategies to implement and this is displayed with Stream-lit based interface. The overall predictive accuracy of performance intelligence model is in the range of 88- 92% continuing to be usefully applicable to today chicken and egg management in cricket.

157. INTELLIGENT MEDICINAL PLANT IDENTIFICATION USING DEEP LEARNING TECHNIQUES

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Traditional medicine relies heavily on medicinal plants for treating various ailments, making accurate botanical identification critical for safety. Because manual identification requires specialized expertise often unavailable to the average person, this paper introduces an automated system leveraging Deep Learning (DL). By utilizing Convolutional Neural Networks (CNN), the system analyzes leaf images to classify species with high precision. Beyond simple identification, the platform provides actionable data on therapeutic benefits, targeted diseases, and safety precautions. Experimental results indicate that DL models are highly effective at bridging the gap between botanical science and healthcare awareness for students, researchers, and farmers.

158. AN OPEN AI-BASED INTELLIGENT ASSISTIVE MEDICINE IDENTIFICATION AND REMINDER SYSTEM FOR VISUALLY IMPAIRED INDIVIDUALS.

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The goal of this project is to give people who are blind or have low vision a device that uses AI to help them. This device will help people become more independent, safe, and able to do everyday tasks. The ESP32 CAM Sense is the system's main microprocessor. It has a camera and a number of sensors that are meant to keep an eye on what's going on around it. You can find out what something is by pressing one button, and you can find out what money is by pressing the other button. When you turn on the camera, it takes a picture and sends it to the OpenAI Vision API. The OpenAI Vision API is in charge of figuring out the currency denomination or the subject of the photo by processing the image data. Real- time audio feedback sends the recognized data to the user so they can interact with the environment in a smooth way. The device has both vision-based help and an ultrasonic sensor that can find obstacles in real time and sound an alarm if a collision happens. The addition of a rain sensor, which can warn the user of bad weather, is another way to make sure that the user is safe and comfortable while they are outside. The device has a tablet finder and reminder feature to help users keep track of their medication schedules. If you forget to take your medicine on time, you can set up an audio reminder to remind you. If you lose your tablet, you can use the tablet finder feature, which will give you audio cues to help you find it. The proposed system combines environmental sensors, health-support features, and AI-based visual recognition into one portable platform. This gives people who are blind a reliable and affordable option. Because it greatly improves mobility, personal safety, medication adherence, and overall quality of life, the device is suitable for daily use. As part of this research, an intelligent assistive device was built and put into use to help people who are blind or have low vision. The device used a combination of sensor fusion and built-in AI to reach its goal. The system can provide real-time awareness of the environment by combining deep learning-based object identification with ultrasonic and inertial sensors. The application of the system makes this possible. Because of this, the system can do this. This is why the system is very accurate and has a moderate amount of latency. The results show that there is a solution that works and can be used on a large scale. They also show that it is possible to use artificial intelligence at the edge for assistive devices. This is a big step forward in building independent mobility.

159. FACTCHECK-MM: A MULTIMODAL NLP SYSTEM FOR SARCASM DETECTION AND CLAIM VERIFICATION

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Fact-checking becomes particularly challenging when claims involve sarcasm, as intended meaning is often conveyed indirectly through context or accompanying visual cues. This paper presents FactCheck-MM, a multimodal NLP framework designed to address this challenge through a three- stage pipeline comprising sarcasm detection, literal paraphrase generation, and evidence-based claim verification. The frame- work integrates transformer-based models, including RoBERTa for classification and T5/BART for paraphrasing, together with cross-modal fusion mechanisms for processing textual and visual inputs; audio modality support is architecturally specified but not activated in the present study. As an initial step toward end-to-end validation, we report a pilot training experiment of the multimodal sarcasm detection module conducted under strict computational constraints, focusing on training stability and implementation feasibility rather than optimized performance. The paraphrase generation and fact verification components are described at the architectural level and reserved for future em-pirical evaluation. By explicitly resolving sarcastic intent prior to factual assessment and by grounding the framework in resource- constrained prototyping, this work establishes an initial empirical baseline for developing sarcasm-aware multimodal fact-checking systems.

160. DETECTION OF UNDULATIONS IN AIRPORT RUNWAYS

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The structural integrity and surface quality of airport runways are paramount to the safety, efficiency, and economic viability of the global aviation sector. As air traffic volume intensifies, the pavement infrastructure endures escalating mechanical loads, leading to subtle yet hazardous forms of distress, most notably surface undulations. Unlike readily visible cracks or potholes,undulations—long-wavelength irregularities manifesting as dips and humps—often evade detection during standard visual inspections yet induce critical dynamic instabilities in aircraft during touchdown and take-off phases. These irregularities compromise braking efficiency, accelerate fatigue in landing gear assemblies, and significantly degrade passenger ride quality. This paper presents the rigorous design, development, and experimental validation of a comprehensive undulation detection system that integrates Light Detection and Ranging (LiDAR), Micro-Electro- Mechanical Systems (MEMS) accelerometers, and redundant linear potentiometric sensors into a cohesive sensor fusion framework. The proposed methodology advances beyond traditional manual profiling by leveraging a multi-modal sensing approach to capture high-resolution topographical and inertial profiles of the runway surface in real- time. By processing disparate data streams through a PIC16F877A microcontroller-based embedded system and visualizing the output via a custom- developed Graphical User Interface (GUI), the system provides airport authorities with immediate, actionable quantitative data. Experimental validation demonstrates that the integrated system achieves a detection accuracy exceeding 95% with a data acquisition latency under 250 milliseconds, offering a robust, cost-effective, and automated alternative to legacy inspection methods. The successful implementation of this technology supports the transition from reactive repairs to predictive maintenance strategies, ensuring compliance with ICAO Annex 14 standards while enhancing operational safety and extending the service life of airfield pavements.

161. DESIGN AND DEVELOPMENT OF A MULTI-TERRAIN HYBRID UAV WITH AMPHIBIOUS WINGS, HIGH RANGE NETWORK COVERAGE WITH ENERGY

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PRESERVATION, AND OPTIMIZED PATH-TRAJECTORY AND PAYLOAD TRANSPORTATION

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Unmanned Aerial Vehicles (UAVs) are increasingly deployed in complex and dynamic environments requiring autonomous decision-making, efficient energy utilization, and reliable communication. This paper presents an integrated multi-agent UAV system that combines Deep Q- Learning (DQN), Surveillance-Adaptive Double Q-Learning (SAVe-Q+), and real-time control mechanisms including PID stabilization and sensor fusion. The proposed system enables cooperative drone behavior in grid-based environments while maintaining network coverage, avoiding adversarial threats, and optimizing energy consumption. Additionally, a complementary filter is employed for accurate orientation estimation, enhancing flight stability. Experimental simulations demonstrate improved convergence, robustness in sparse reward environments, and enhanced coordination among agents. The integration of learning-based intelligence with embedded control systems makes the proposed approach practical for real-world UAV deployments.

162. OFFLINE GPS-BASED OCEAN BORDER ALERT SYSTEM FOR FISHERMEN

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Fishermen operating in the India-Sri Lanka maritime boundary frequently experience unintentional boundary crossings due to poor visibility, a lack of reliable navigational tools, and the high cost of GPS-based equipment. These situations frequently result in arrests, lost boats, and safety risks. A low-cost GPS-based maritime border alert system using the Arduino UNO microcontroller is suggested as a solution to this issue. The NEO-6M GPS module's real-time latitude and longitude positions are continuously sent into the system, which then compares the current position with the previously stored maritime border positions. The system warns fisherman when the boat approaches the boundary using LEDs, a buzzer, and an LCD display. The device is reliable in the deep-sea environment because it runs

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entirely offline and doesn't require a cell or internet connection. When simulated boundary coordinates are used, this prototype will display accurate and timely notifications. The design is compact, economical, and manageable for the local fishermen. With its open-source software and inexpensive hardware, the device has the potential to be a useful navigation safety tool that might help prevent inadvertent maritime boundary violations. The fishing community will be safer and more secure if the model is designed to enable GSM or satellite modules for sending distress signals.

163. INTEGRATED COASTAL FLOOD MAPPING AND IMPACT ASSESSMENT USING SAR IMAGERY AND HYDROLOGICAL DATA

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Coastal floods are among the most destructive nat- ural disasters, driven by rainfall, storm surges, river overflow, and sea-level rise. Conventional optical satellite methods are constrained by cloud cover during extreme weather, limiting real- time monitoring. This paper presents an integrated framework combining Synthetic Aperture Radar (SAR) imagery, geologi- cal factor analysis, hydrological modelling, and flood impact assessment for Tamil Nadu's 161 sub-districts. Module 1 im- plements a Frequency Ratio (FR) pipeline over 20 geological conditioning factors (JRC, MODIS, Sentinel-1, SRTM, ERA5- Land) to produce a normalised Flood Susceptibility Index (FSI). Module 2 applies SAR backscatter change detection with machine learning to map flood extent and generate 2-D/3-D visualisations for cyclone events including NIVAR (2020) and Fengal (2024). Module 3 quantifies socio-economic impact by overlaying flood masks with WorldPop, LULC, and infrastructure datasets. Mod- ule 4 performs terrain and hydrological analysis using Random Forest trained on 2015 Tamil Nadu flood records. All outputs integrate into a Flutter mobile application with interactive risk mapping, flood propagation analysis, and an AI-powered disaster- event query interface. Results confirm that coastal and deltaic sub-districts experience Very High susceptibility, with TWI, flow accumulation, drainage density, and NDVI as dominant drivers.

164. REAL-TIME AI/ML-BASED PHISHING DETECTION & PREVENTION SYSTEM

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Phishing attacks remain one of the most common and harmful types of cybercrime, costing individuals and organisations billions of dollars each year. Traditional phishing detection methods rely a lot on blacklists and rule-based systems. These methods often struggle to keep up with the changing attack strategies. This project introduces PhishSnif, this an automated phishing prevention system that uses machine learning to analyse URLs. The system uses a TF-IDF (Term Frequency-Inverse Document Frequency) vectorizer along with the Logistic Regression classifier to examine the features of URLs. It classifies them as either phishing or legitimate. The model was trained on a balanced dataset of 20,000 URLs and achieves an accuracy of 95.95% on the test set, with precision and recall values of 0.96 for both classes. In addition to basic URL classification, PhishSnif includes a unique cloaking detection

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module. This module finds inconsistencies between the content shown to the crawlers and that show to human users. Phishing sites often use this technique to avoid detection. The system is presented as a Flask-based web application with user authentication, a single URL prediction feature, and batch processing through CSV or Excel file uploads. It also has a complete prediction history dashboard. An admin panel allows oversight of all user actions and system-wide statistics. The entire system is designed to be easy to deploy, secure, and scalable. Experimental results show that this system offers fast, accurate, and reliable phishing detection, making it suitable for real-world use.

165. AI-POWERED VIRTUAL FITTING ASSISTANT FOR PERSONALIZED CLOTHING SIZE RECOMMENDATION

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VisionFit, as proposed in this paper, is a hardware- independent, contactless body measurement system that seeks to resolve the size issue faced by E-commerce Apparel with the help of standard monocular webcams." The system does not need any specific objects or systems, and it has proposed a new "Dual Anchor Anthropometric Calibration" technique that uses two anatomical proportionalities, namely, nose to hip midpoint (48% of height) and nose to ankle midpoint (82% of height), by using a scale blending regression method of (0.6:0.4) with varying camera distance. The stability of this system is ensured by using a "30 Frame Temporal Stabilization Pipeline with Variance-Based Jitter Rejection (less than 0.01)". The system also has the advantage of posture correction by ensuring that five geometrical elements are checked at one time, namely, framing, tilting, levelness, symmetry, and visibility. The results are then matched in size ranges with ten significant apparel brands in real time, namely, Nike, Adidas, Zara, Allen Solly, etc., using the nearest neighbor classification method. The system is a completely offline application on the desktop using Fast API and Pyweb View, ensuring a dimensional consistency of ±0.8 cm. Keywords- Anthropometric measurement, Media Pipe pose, jitter rejection, time multi-frame stabilization, and dual-anchor calibration, anonymous body-sizing, monocular pose estimation, fast API, clothing size recommendation, Pyweb view, clothing advice, orthogonality of postures, nearest neighbour.

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166. ENVIRO VIGILANT: A UAV-BASED IOT SYSTEM FOR REAL-TIME ENVIRONMENTAL MONITORING AND ALERTING.

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Environmental surveillance in hazardous industrial zones and disaster-stricken areas remains a challenge for traditional stationary monitoring stations due to their lack of mobility and high infrastructure costs. This paper presents Enviro Vigilant, a mobile, UAV-mounted Internet of Things (IoT) platform developed for high- resolution atmospheric sensing. The system architecture utilizes an Arduino Uno as the central processing unit, interfacing with a sophisticated multi-sensor array including an MQ-135 gas sensor, MQ-7 carbon monoxide sensor, MQ- 137 ammonia sensor, and an MH-Z19 sensor. Atmospheric metrics are tracked via a DHT11 temperature and humidity sensor and a ZPH02 particle sensor for comprehensive air quality index (AQI) mapping. For precise location-based data logging, the system integrates a NEO-6M GPS module, while an OLED display provides on-site telemetry. A threshold-based firmware algorithm triggers an integrated buzzer for immediate localized alerts if pollutant concentrations exceed safety limits. Real-time data is synchronized with a cloud-based dashboard for remote visualization and emergency response coordination. Experimental validation confirms the system's ability to reliably detect and map pollution hotspots in complex environments.

167. CONSTRUCTION SITE SAFETY & COMPLIANCE MONITOR

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Construction sites are dangerous places, and workers are often at risk because construction sites use outdated working methods or do not have constant monitoring of the work being done. The old way to manage safety is by having people working on site, but this form of safety management is very inefficient and relies heavily on the supervisor's performance and ability to see what is going on in the workplace and when there are violations. In this project, we are proposing a Construction Site Safety & Compliance Monitor (CSSCM) which will enable real-time monitoring of construction sites through the use of Artificial Intelligence (AI) and Computer Vision (CV) technology. The CSSCM system will use video cameras that will be placed on the construction site to capture a live video feed from the construction site and process this information using object detection models (such as YOLO – You Only Look Once). The object detection model will allow the system to identify workers on the construction site as well as workers who are not wearing PPE (Personal Protective Equipment) such as hard hats and safety vests; identify workers performing unsafe acts; and identify workers who are entering restricted areas on the construction site. The video feed captured from the construction site will be processed by machine learning (ML) to ensure accurate and effective identification of workers and identify violations of MSL, SS, CSM, or CSSCM; and generate a real-time alert; and maintain a log of all identified violations on the construction site for future reference and analysis. The proposed CSSCM will be a more efficient method of managing construction site safety, and it will also improve safety compliance for every worker on the construction site. The CSSCM proposal will increase the overall safety of all workers on a construction site, and decrease accident rates on construction sites, as well as provide the opportunity for construction project managers to more effectively and more efficiently manage construction sites.

168. NEUROLEARN: AN AI-POWERED ADAPTIVE LEARNING PLATFORM FOR NEURODIVERSE STUDENTS

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About 15–20% of the students have distinct neurological conditions like ADHD, Autism Spectrum Disorder, or Dyslexia. Most of the e-learning platforms do not focus on these students.This paper presents NeuroLearn, an adaptive learning platform that was developed keeping the accessibility in mind for such students from the start. NeuroLearn goes beyond other systems that just change the level of content depending on quiz scores. It also analyses how students use the interface and make things less visually complicated in real time when it figure out any sign of brain overload. The platform combines three different ways to suggest the correct learning materials while keeping them easy to find: collaborative filtering, contentbased filtering, and teaching guidelines. The system leverages modern web technologies such as React, Node.js, and MongoDB, along with Python-based machine learning services. It follows the ideas of Universal Design for Learning and the standards for accessibility in WCAG 2.1. The emotion-sensing module works exclusively on the client side, thus no raw behavioral data leaves the browser. The model for predicting engagement achieves an R 2 of 0.945, and the model for adjusting difficulty gets a R 2 of0.999. The system meets all of the WCAG 2.1 AA accessibility requirements. These data show that personalization and accessibility are not competing aims but rather go hand in hand.

169. AI-BASED SMART ROAD NETWORK PLANNING USING SATELLITE IMAGERY

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Planning efficient transportation infrastructure requires balancing engineering feasibility, environmental sustainability, and accessibility to population centers. Traditional road alignment methods rely heavily on manual geographic analysis and field surveys, which are time-consuming and often limited in their ability to evaluate multiple spatial factors simultaneously. Recent advances in remote sensing and artificial intelligence have enabled the integration of satellite-derived data with computational optimization techniques for infrastructure planning. This research proposes an AI-assisted smart road network planning framework that utilizes Cartosat Digital Elevation Model (DEM) data from ISRO Bhuvan and population density information from the WorldPop dataset to construct a multi-criteria spatial cost model. The methodology integrates terrain analysis, demographic demand assessment, and geospatial decision support within a unified optimization environment. An enhanced A* search algorithm is employed to generate candidate transportation routes that minimize construction difficulty while maximizing accessibility to populated regions. Unlike deep learning-based road extraction approaches that require extensive labeled datasets, the proposed framework leverages interpretable heuristic optimization combined with GIS- based modeling for practical deployment. A case study conducted for the Delhi region demonstrates that the proposed system produces routes that better reflect real-world planning considerations compared with conventional shortest-path techniques. The framework highlights the potential of combining open geospatial data platforms, with AI-driven spatial decision support systems, contributing toward sustainable infrastructure development aligned with global urbanization goals.

170. ADAPTIVE MULTI-LEVEL BYTE MASKING WITH HYBRID DEEP LEARNING FOR ADVERSARIALLY ROBUST MALWARE DETECTION

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Malware attacks are becoming highly common and a great threat to the contemporary computer systems and networks. The conventional signature-based detection techniques do not tend to detect new malware variants as well as the obfuscated ones. In this paper, the author suggests upgrading the malware detection system to deep learning. It takes raw binary files in the form of Portable Executable (PE) and translates them into fixed length normalized sequences of bytes. A basic Convolutional Neural Network (CNN) model is used to identify malware and benign files using pattern at the byte level that has been learned on a dataset, like EMBER and BODMAS. To enhance accuracy and robustness of detection, the proposed system employs adaptive multi-level byte masking, hybrid deep learning architecture (CNN + Transformer encoder) and adversarial training. Every binary files are generated in various hidden variants and tested with the help of voting through confidence-weighing. Methods like SHAP and attention visualisation emphasize Most of the byte areas. Experimentation on EMBER (2020) and BODMAS data sets shows an accuracy of 97.8% and F1-score of 0.97, and higher resilience to adversarial alterations than baseline models such as MalConv.

171. SAFEMAIL: A HYBRID AND PRIVACY-AWARE EMAIL PHISHING DETECTION SYSTEM

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SafeMail is a lightweight and privacy-aware email security platform designed to protect users from phishing at- tempts by analyzing suspicious links, email text, and attachments before interaction. The system follows a local-first workflow to reduce unnecessary exposure of sensitive email content while maintaining fast performance and practical usability. SafeMail combines rule-based heuristics with machine learning techniques to detect phishing indicators such as deceptive URLs, urgency- based language, impersonation cues, and dangerous file attach- ments. A strict default-deny strategy is adopted, where potentially harmful elements remain blocked until they are verified as safe. In addition to classification, the platform generates an explainable threat score and clear warnings that help users understand why a message has been flagged. This improves both technical protec- tion and cybersecurity awareness. The platform includes inbox monitoring, compose-time validation, suspicious-link blocking, attachment inspection, report generation, and optional commu- nication modules such as chat, call, and email scheduling. Exper- imental evaluation on labeled email data demonstrates that the proposed hybrid approach achieves strong detection performance while preserving usability and deployment simplicity. Overall, SafeMail offers a practical solution for educational institutions, privacy-sensitive organizations, and end users seeking lightweight but effective phishing defense.

172. FPGA IMPLEMENTATION OF AES ALOGRITHM SECURE DATA ENCRYPTION & DECRYPTION USING AES-128 ALGORITHM

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Security has become a critical requirement in modern digital communication systems. The Advanced Encryption Standard (AES) is highly employed in the transmission of secure data because it has the strong encryption power and efficiency. This paper provides the design and implementation of a system of AES-128 encryption and decryption on FPGA through Verilog Hardware Description Language (HDL). The system proposed is made of major functional modules of SubBytes, ShiftRows, MixColumns, AddRoundKey and key expansion. The Xilinx Vivado is used to implement the design, which is functionally verified with standard test vectors to verify that it is correct. The performance of the synthesis is able to show good usage of hardware only at 2.21% LUTs and 0.94% Flip-Flops. The system has a latency of about 110ns and a throughput of about 1.16Gbps, which is a high throughput system. The FPGA implementation is a secure, high speed and resource efficient solution that can be used in real-time cryptography application.

173. SMART CLASSROOM ENGAGEMENT & ATTENDANCE SYSTEM USING MACHINE LEARNING

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A problem with manual or paper-based attendance monitoring in schools is proxy attendance, data duplication, it takes a lot of time to capture and keep all records in the record. This paper focuses on the proposed QR-Based Smart Attendance Monitoring system where the mobile front-end is built with Flutter and the back-end is built with Python FastAPI and stored with SQLite database. The system

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creates a unique dynamic QR-Code for each lecture that changes every 30 seconds to let the student mark their attendance by scanning the QR-Code on the teacher's mobile. The system includes another new feature where it detects mobile misuse. Students' mobile would be monitored for any misuse that they have during the class time once the attendance is taken, so in case if the student changes his mobile to any other application for total time 3 minutes or above than it changes the attendance of the students from Present to Absent in the record of attendance. Real time monitoring is done through the teacher's dashboard, and can also override the presence of student manually. This is the efficiency of this attendance checking and mobile miss-use prevention system.

174. DIGITAL TIME CAPSULE: ANALYSING THE EVOLUTION OF ONLINE BEHAVIOUR AND THE CHANGING DEFINITION OF NORMALCY

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The rapid growth of digital platforms has signif- icantly influenced human behaviour, shaping how individuals interact, communicate, and perceive social norms. This paper presents the Digital Time Capsule, a web-based system designed to capture and analyse changes in online behaviour over time, particularly before and after the COVID-19 pandemic. The system allows users to record their digital habits, which are then compared with historical data to identify behavioural trends. Using data analysis and visualisation techniques, the platform provides insights into variations in productivity, digital engagement, and work-life balance. To enhance system capabilities, advanced features such as intelligent behaviour analysis, real-time health alerts, temporal tracking, behaviour classification, and personalised recommen- dation mechanisms are proposed. These enhancements enable deeper behavioural understanding, early detection of deviations, and improved digital well-being through adaptive and data- driven insights. The results highlight noticeable shifts in user behaviour influenced by increased digital dependency. The proposed system not only enables personal reflection but also contributes to un- derstanding how technology continuously reshapes the definition of "normal" in modern society.

175. MULTI-HORIZON CYCLONE TRACK PREDICTION USING A CNN-MLP APPROACH

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Precise predictions of tropical cyclone tracks are vital for disaster readiness in the North Indian Ocean (NIO), where studies focusing on data-driven forecast algorithms are scarce. In this paper, we propose a hybrid CNN-MLP framework for the multi-step forecast of tropical cyclones. This model integrates the encoding of large-scale steering flow features via convolutional operations and the temporal persistence of small-scale cyclone motions using dense connection layers. The proposed model forecasts tropical cyclone displacements 6, 12, 24, and 48 hours ahead based on 3,096 cyclone samples from the IBTrACS and ERA5 data sets ranging from 2006 to 2025. With the proposed model, mean absolute errors of 20.32 km, 37.78 km, 69.89 km, and 127.51 km were obtained at different forecast steps. We found that our model outperforms GRU-based models in the medium-range forecast step.

176. AN INTELLIGENT TELE-HEALTH PLATFORM FOR EARLY HEART DISEASE PREDICTION UTILIZING A SOFT-VOTING ENSEMBLE CLASSIFIER

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Heart disease continues to be one of the top causes of death around the globe. So, catching it early is important for successful treatment and prevention. Many traditional methods of machine learning usually use just one classification model, which can sometimes lead to problems with predictions because of bias or variance. In this study, we suggest a new prediction system for heart disease that combines four different machine learning algorithms: XGBoost, AdaBoost, Random Forest, and Support Vector Machine (SVM). Instead of depending on just one classifier, our model calculates the average prediction probability from all four algorithms to improve reliability and accuracy. Our experiments show that this method of averaging works better than individual models when it comes to accuracy, precision, recall, and F1- score. This new framework offers a dependable and scalable way to predict cardiovascular disease in its early stages.

177. ARCHITECTING AN INTELLIGENT MULTILINGUAL JURISPRUDENTIAL CONVERSATIONAL AGENT UTILIZING ADVANCED MACHINE LEARNING PARADIGMS

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Accessing legal information is a challenging task due to the presence of complex terminology, extensive documentation and language barriers. Traditional legal search systems rely on keyword based retrieval which often fails to capture the contextual meaning from the user queries. To address these limitations, this work presents a jurisprudential conversational agent that uses artificial intelligence and advance natural language processing techniques to improve legal information accessibility. This system makes use of language detection, neural machine translation, semantic embedding generation and vector based similarity search to retrieve relevant legal content. A Retrieval-Augmented Generation (RAG) framework is employed where retrieved legal documents are used as contextual input for a transformer based model to generate accurate and structured responses. Furthermore, the system is able to support multilingual interactions wherein people can ask questions in their own language and obtain legal information in a simplified form. Experimental observations indicate that the integration of semantic retrieval and generative AI improves response relevance and reduces dependency on manual legal research.

178. ARTIFICIAL INTELLIGENCE (AI)-BASED EARLY DIAGNOSIS AND GRADE OF POLYCYSTIC OVARY SYNDROME BASED ON HORMONAL MARKERS AND MACHINE LEARNING

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Polycystic Ovary Syndrome (PCOS) is a common endocrine and metabolic disease that occurs in women of childbearing age, and can often be linked with menstrual dysfunction, infertility, hormonal imbalance, obesity, insulin resistance and increased risk of diabetes and cardiovascular disease. The current research paper presents a machine learning- based diagnostic model to detect PCOS early in its development and grade its severity with the help of hormonal and metabolic factors to be identified. The clinical characteristics are the level of luteinizing hormone, follicle-stimulating hormone, concentration of testosterone, level of insulin, body mass index and age. Data preparation includes cleansing, normalization and optimization of features that have been used to improve prediction. The classifiers that are trained and compared include random Forest, Support Vector Machine, LightGBM, and Artificial Neural Network classifiers. Proposed model.Proposed output implementation model presents risk scoring, severity classifications and customized health advice with a web-based clinical decision support interface, yielding 94.8% accuracy in classification. Clinical significance in terms of rapid screening potential, less dependency on manual processes, and better diagnostic consistency

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enhances prompted intervention and enhanced reproductive health management. Additional opportunities to improve access, cost efficiency and scaling deployment potentials further bolster clinical adoption opportunities in hospitals, diagnostic services and telehealth settings.

179. AUDIO-DRIVEN PREDICTIVE MAINTENANCE AND MACHINE MONITORING SYSTEM

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In modern manufacturing environments, unplanned machine failures cause costly downtime and inefficiencies. Traditional sensorbased monitoring systems often require multiple devices, complex installations, and high costs. This project proposes a novel, audiodriven approach for realtime machine monitoring and predictive maintenance, using microphone recordings of machine sounds as the primary data source. The core idea is to capture acoustic signatures from machines (via microphones), extract relevant audio features (such as MFCCs, RMS, amplitude mean, zero crossing rate), and feed them into a machine learning model (a Convolutional Neural Network) to classify machine states (e.g. operational, idle, faulty) and detect early signs of abnormalities. The system is complemented by a web application (frontend in React.js, backend in Node.js/Express.js, database MongoDB) that supports live monitoring, alerting, machine analytics (timeseries of audio features), and dashboard visualization. During development, the system has been prototyped on textile machines, demonstrating promising results in distinguishing healthy vs. faulty conditions. Although still in the prototype stage, the approach offers advantages in cost, scalability, and nonintrusiveness compared to traditional IoT sensor deployments. The repository is open for further contributions, improvements, and adaptation to broader industrial settings.

180. COLLABORATIVE BASED EARLY RESPONSE FOR SUPPLY CHAIN DISRUPTION USING TRANSFORMERS MODEL

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Supply chains face significant risks from natural disasters, political conflicts, transportation delays, and market fluctuations. Existing monitoring tools detect issues only after disruptions occur, limiting proactive decision-making and causing operational inefficiencies and financial losses [1], [2], [10]. The proposed system leverages multi-source data—including shipment logs, weather forecasts, news articles, social media, and market trends—to forecast potential disruptions in advance. The system employs Hugging Face Transformers for NLP, enabling contextual understanding of unstructured news and social media data; Graph Neural Networks (GNNs) for modeling complex supplier-distribution networks [13]; Convolutional Neural Networks (CNNs) for pattern recognition in structured logistics and inventory datasets [17]; and LSTM/GRU models for accurate time-series forecasting of shipment and demand trends [11]. CNNs are preferred over other advanced architectures due to their efficiency in detecting spatial-temporal patterns in structured numerical datasets, while GNNs and Transformers handle relational and textual data, which alternative models alone cannot capture effectively. This methodology encompasses data collection, preprocessing, feature engineering, model training, risk scoring, and real-time alerts with actionable recommendations, deployed on cloud platforms for scalability [6]. Compared to existing systems, this framework offers proactive and intelligent disruption prediction, higher accuracy through multi-source data fusion [18], early actionable alerts, and enhanced resilience for supply chains of varying scales [3], [4]. By integrating state-of-the-art AI methodologies and combining structured, unstructured, and relational data, the system not only anticipates potential risks but also provides decision support for timely mitigation, significantly reducing operational losses and ensuring smoother continuity in global supply operations. Recent studies shows the importance of integrating sentiment-aware analytics and hybrid CNN-LSTM architectures to strengthen predictive robustness in supply chain environments [16], [17], [19], [21].

181. CRIME CONNECT: A SECURE ONLINE FIR AND COMPLAINT MANAGEMENT PLATFORM WITH MACHINE LEARNING–DRIVEN CRIME ANALYTICS

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The conventional First Information Report (FIR) filing process in India is burdened by mandatory physical presence at police stations, paper-driven workflows, opaque case-handling, and institutional barriers that discourage timely crime reporting. CrimeConnect is a secure, role-stratified, web-native platform designed to eliminate these barriers by enabling citizens to register complaints and FIRs online, upload supporting evidence, and track case status in real time through automated notifications. The system is architected as a three-tier application — a Citizen Portal, a Police Dashboard, and an Admin Module — underpinned by Python/Flask REST APIs and a MySQL relational database. An embedded machine learning analytics engine applies Random Forest, Gradient Boosting, XGBoost, Decision Tree, Logistic Regression, SVM, KNN, AdaBoost, LightGBM, and K-Means Clustering to automate complaint categorization, predict case resolution timelines, and map geographic crime hotspots. Experimental evaluation yields a peak classification accuracy of 92% (Random Forest, F1 = 0.92) and a mean system response time of 3.2 seconds under 100 concurrent users. CrimeConnect extends the blockchain-driven vision of Nivaran (IEEE ICICV 2024) into a fully browser-accessible, ML-augmented platform that requires no cryptocurrency infrastructure, dramatically broadening reach and adoption.

182. TRANSFORMING CUSTOMER INSIGHTS: REAL – TIME SENTIMENT DETECTION WITH NLP AND STREAMING PIPELINES

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In today's fast-paced digital world, tracking the emotions of customers in real-time is critical to making informed and responsive decisions. This paper describes a sentiment analysis system that provides a means of real-time sentiment analysis through Natural Language Processing (NLP) and a stream processing pipeline that allows you to analyze continuous streams of text data produced by social media channels, live chats, and customer comments. The system uses advanced NLP transformer-based models to classify the sentiment of the text when it is received,eg., positive, negative, or neutral. The stream processing pipeline uses Apache Kafka for stream integration technology, allowing for low-latency, high-performance data processing. This structure supports real-time sentiment tracking, enabling organizations to analyze trends, analyze public sentiment, and respond to the sentiment of customers in real-time. The approach presented in this paper is highly accurate, scalable to your needs, and highly applicable for real-time applications in marketing, customer interaction, and public relations. The work also contributes to the new field of real-time data analytics by providing a practical solution for intelligent, real-time sentiment tracking.

183. AI-POWERED PERSONALIZED LEARNING PATH DASHBOARD FOR SKILL DEVELOPMENT

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The Learning Path Dashboard (LPD) is a smart, user-friendly platform, which helps to guide and speed up individual skills. In the modern age of hectic digitalism, when the majority of learners are digitally engaged, a lot of learning theories have been outdated as they do not accommodate variations in the knowledge, speed and preference of learners, resulting in less engagement and inefficient learning results. To address these issues, this project suggests using an AI-driven Personalized Learning Path Dashboard which dynamically creates individual learning paths depending on the skill level, goals, performance and progress of the learner. In the system, Deep Knowledge Tracing (DKT) is added with Recurrent Neural Networks (in particular, Long Short-Term Memory (LSTM)) to monitor the behavior of learning and predict further performance, allowing adaptive recommendations. Also, the systems are equipped with Natural Language Processing methods based on models such as BERT to analyze the

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learning content and input provided by the learner to enable the system to offer relevant resources and smart feedback. They also have progressive feedback, analysis of skill gaps and real-time recommendations in the dashboard which increases the efficiency of learning and retention of knowledge. All in all, the given system shows that a synthesis of DKT and NLP can be used to develop a more individualized, adaptive, and efficient learning experience to develop skills.

184. A COMPREHENSIVE REVIEW OF AUTOMATED TUNNEL INSPECTION ROBOTS USING COMPUTER VISION, UAVS, AND SENSOR-BASED TECHNOLOGIES.

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Underground tunnels are an important part of modern infrastructure. They are used for transportation, mining, and utility services. To keep them safe and reliable, regular inspections are needed to detect problems like cracks, structural damage, water leakage, and harmful gases. Traditionally, tunnel inspections are done manually by workers. This method is slow, requires a lot of effort, and can be dangerous due to poor visibility, narrow spaces, and exposure to toxic gases. With recent advancements in robotics and sensor technologies, automatic tunnel inspection systems have been developed. These systems make inspections faster, safer, and more efficient than manual methods. This review focuses on different types of tunnel inspection robots such as ground based mobile robots and aerial vehicles (UAVs). These systems use various sensors to monitor tunnel conditions. Important technologies used include camera based inspection, automatic navigation, environmental monitoring, and wireless communication for data transfer. The study compares different research works based on sensors, robotic platforms, and operating systems. It also discusses the advantages, limitations, and challenges of these systems.

185. DYNAMIC SCHEDULING FOR REAL-ROAD MONITORING AND ACCIDENT MANAGEMENT IN INTELLIGENT TRANSPORTATION SYSTEMS

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The frequency and severity of accidents in the roads has been growing because of the rapid increase in traffic in urban centers, which has put an extreme strain on the current Intelligent Transportation Systems (ITS) intelligence that is required to monitor the roads and provide quick response in situations where accidents occur. Traditional traffic monitoring systems use fixed time scheduling and human intervention which restricts responsiveness to unpredictable roadways. The paper describes a dynamic make scheduling framework of real time road monitoring and accident management driven by machine learning. The suggested system will help combine roadside cameras and traffic sensors to constantly analyze the movement of vehicles, changes in speed, and congestion patterns of various parts of the roads. A trained machine learning model identifies some anomalies like collisions, abrupt deceleration, and obstruction on the lane which signifies a possible accident. On detection, a dynamic scheduling mechanism automatically manages the allocation of monitoring resources and gives priority to the affected zones to reduce the response time. The framework also helps in the automated alert generation, control of the automatic signals and traffic diversion plans to minimize secondary congestion. Through experimental analysis, it is evident that there is better accident detection speed, better resource use and minimized the monitoring latency than in the case of the static surveillance methods. Combination of smart transport system detection and intelligent scheduling offers the potential of an efficient and practical solution to smart city infrastructure. The contribution made by this work is to provide a single framework that leads to more efficient operations and responsiveness to emergencies in real-time ITS settings.

186. A DATA-DRIVEN ANALYSIS OF SOCIAL MEDIA'S IMPACT ON HUMANS USING NLP AND RF CLASSIFICATION

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Today digital health research has a significant gap because we rely too heavily on outdated, static datasets that don't accurately reflect people's real-time behaviour. To address this issue, a live web-based framework and an intelligent system were developed. This system employs a Flask-driven pipeline that directly collects primary behavioral data from active users. By managing crucial inputs—specifically, the ratio of screen time to sleep and self-reported anxiety levels—within a MySQL backend, we ensured the platform's capacity for natural scalability as user engagement increased. To facilitate actionable insights from the raw data, a Random Forest (RF) classification model was employed to detect and classify instances of digital distress. The model was then tested on a dataset of 1,921 user responses, tailored to specific needs and continually updated. The model's performance was notably strong, yielding an accuracy of 93.5%, a precision of 93.5%, and an F1 score of 93.4%. Moving beyond simple data analysis, we also engineered an automated intervention module. This module uses Simple Mail Transmission Protocol (SMTP) with Transport Layer Security (TLS) encryption to send out "Digital Behavioural Alerts" whenever the system detects high-risk patterns. The study's findings revealed that 50.3% of participants fall into the "high impact" category, demonstrating the importance of scalable, real-time tools to support mental health in the digital age.

187. OPTIMIZATION OF GLASS FIBER PERCENTAGE IN CONCRETE FOR ENHANCED MECHANICAL PERFORMANCE

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Concrete is widely used in construction but can suffer from cracking under tensile stress, leading to repairs. This study investigates glass fiber reinforcement in concrete to improve performance. Tests evaluated strengths with 0-12% fiber volume, showing up to 19.6 MPa compressive and 4.5 MPa flexural gains at 12% fiber. GFRC offers durable alternatives for prestressed elements.

188. EMPLOYMENT AND ANALYSIS OF COTRAVELX: A SMART SYSTEM FOR COLLABORATIVE TRAVEL PLANNING AND EXPENSE SPLITTING

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Group travel requires effective collaboration among multiple participants. It involves itinerary planning, accommodations booking and shared expense management. Existing solutions for the splitting of expenses are only for final settlement of the expenses incurred after the trip has occurred. There is no collaboration in the existing systems for booking travel. In this paper, the proposed smart travel plans and split expenses application is named as CoTravelX. Using the proposed application, travel groups with both known and unknown persons can be created, and it enables travellers to search for hotels and restaurants as well as manage. Split expenses instantly. The proposed application brings together travel search, travel group creation, and smart expense management to make group travel easier and smoother. The proposed method not only makes the application more transparent and reduces manual computations but also facilitates coordination between the travel group members.

189. ZERO-COMMISSION FREELANCING PLATFORM WITH TOKEN-BASED VISIBILITY AND DYNAMIC REPUTATION ALGORITHM

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Usually, freelancing platforms take 15% to 30% commission fees from project earnings, which creates a high barrier for new sellers who face both financial limitations, while there are reputation advantages for established freelancers. Existing systems favour incumbents through static ranking algorithms that overweight legacy feedback, making it nearly impossible for newcomers to compete effectively. This research presents a commission-free freelancing platform which enables freelancers to retain 100% of their project earnings while implementing sophisticated mechanisms for fair marketplace competition. The system involves a token-based model that provides an initial gig visibility boost on keywords for newcomers, a time-weighted reputation algorithm that decays legacy feedback while prioritizing recent performance and good reviews, and a subscription model featuring a set number of tokens a month, verified skill badges, and notifications when a client posts a job related to the freelancer's skillset.

190. QUALITY IMPROVEMENT OF PLASTIC INJECTION MOLDING PROCESS THROUGH DOE FOR REDUCING VARIOUS DEFECTS – A REVIEW

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Injection molding is a widely used polymer processing method due to its high production rate, low cost and capability to produce intricate Parts with high precision. It is much difficult to set optimal process parameter levels which may cause defects. This paper deals with optimal injection molding process parameters for reducing defects. In this review paper, optimal injection molding conditions for minimum defects were determined by the DOE technique of Taguchi also called Offline quality control and the analysis of variance (ANOVA) methods.

191. SMART CAMPUS: AN INTEGRATED WEB-BASED PLATFORM FOR AUTOMATED ACADEMIC, ADMINISTRATIVE, AND STUDENT SERVICES MANAGEMENT IN HIGHER EDUCATION INSTITUTIONS"

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SmartCampus is a role-aware web platform designed to bring academic, administrative, and student service workflows into one integrated system for higher education institutions. The platform combines a React- based frontend, a PHP backend service layer, and MySQL data storage to support day-to-day campus operations through role-specific dashboards and controlled API access. The current

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implementation spans a wide institutional scope, including student and teacher workflows, HOD/coordinator operations, attendance management, SOS reporting, live location updates, and office modules such as registrar, accounts, examination, placement, hostel, library, and student affairs. A key practical contribution of SmartCampus is the way it reduces fragmentation: instead of separate tools for each department, it offers a single operational environment with shared records, faster coordination, and clearer accountability. Implementation evidence from the codebase indicates meaningful progress in token-backed access flows, route-level role separation, attendance session lifecycle handling, emergency alert routing, and notification/logging support. At the same time, the project also reflects realistic engineering gaps seen in large evolving systems, including uneven endpoint hardening, placeholder APIs in selected modules, mixed query-safety practices, and frontend lint-quality issues in some components. These findings do not reduce the value of the platform; rather, they define a clear maturity path. With systematic hardening, uniform authorization enforcement, secure query standardization, and automated quality/security testing, SmartCampus can transition from a feature-rich institutional platform into a robust production-grade digital campus infrastructure.

192. DYNAMIC ENERGY SPARSE SELF-ATTENTION BASED ON INFORMER FOR REMAINING USEFUL LIFE OF ROLLING BEARINGS

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In industrial rotating machinery, rolling bearings are core and critical components because they directly determine the operational reliability and safety of the entire system. Therefore, accurate Remaining Useful Life (RUL) prediction plays a critical role in Machinery Health Management (MHM). Traditional machine learning models cannot capture long-range temporal dependencies in rolling bearing vibration signals and usually rely on handcrafted feature extraction. This approach may limit prediction accuracy under varying machinery operating conditions. To address these challenges, this research proposes Dynamic Energy Sparse Self-Attention neural network architecture. The proposed method begins by transforming vibration signals into time–frequency representations using the Auto-Reassignment Transform to capture detailed degradation characteristics. The Informer-based encoder processes these features and employs a dynamic energy sparse self-attention mechanism to emphasize informative components in the degradation sequence while reducing computational complexity. In

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model architecture, Monte Carlo Dropout is employed to estimate prediction uncertainty and enhance model prediction performance. The performance of the proposed approach is evaluated using a bearing degradation dataset based on mean absolute error (MAE) and root mean square error (RMSE). The results indicate that the integration of high-resolution time– frequency analysis with efficient sparse attention modeling achieves high prediction accuracy and strong generalization performance, outperforming conventional methods for reliable RUL prediction in industrial applications.

193. A HYBRID DEEP NEURAL NETWORK WITH HIERARCHICAL FEATURE AGGREGATION FOR AUTOMATED SKIN CANCER CLASSIFICATION

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In this work we describe a deep learning method for automatically classifying skin diseases based on dermatoscopic images extracted from the HAM10000 dataset. We use the class conditional Generative Adversarial Network (GAN). To generate more samples from those minority groups during the training process in order to reduce class imbalances and to account for the significant visual similarity between the lesion categories. Furthermore, EfficientNet-B4 backbone is used to extract features from multiple scales, and an attention-based feature is used to reduce the amount of attention required for each clinically significant part of the lesion. Lastly, Monte Carlo Dropout is applied at inference in order to provide stochastic approximation of predictive uncertainty —this enhances the reliability with which the model makes predictions. The efficacy of the model is examined experimentally, and the experimental results show solid classification performance and generalization ability, which supports the feasibility of the Proposed Framework for reliable and interpretable computer aided diagnosis of Skin Diseases.

194. DESIGN AND IMPLEMENTATION OF COUNTER WITH CLOCK ENABLE MAPPING

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Power consumption is a major constraint in the design of VLSI systems, especially in FPGA and portable electronics design applications. In the design of VLSI systems, counters are basic building blocks used in the implementation of digital systems. Though counters are simple in functionality, inefficient use of HDL might cause unnecessary switching activity, hence increased power dissipation in the system. Therefore, this project aims to design power-efficient 4-bit Unsigned Up Counters through the use of effective HDL coding techniques and the implementation of two different design methods, specifically the conventional clock-enable and optimized LUT-based clock-enable design methods. It is imperative that the power consumption in the system is reduced without affecting the functionality of the system; the design was assessed through simulation, RTL, and design evaluations via the Vivado tool.

195. SMART MORSE-BASED VOICE COMMUNICATION FOR THE SPEECH-IMPAIRED

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Communication is a fundamental human need, yet individuals with speech impairments often face significant challenges in expressing their thoughts verbally. This project proposes a Smart Morse-Based Voice Communication System designed to assist speech- impaired individuals by converting Morse-code-based inputs into audible voice output. The system allows users to generate Morse signals through simple input methods such as buttons, touch sensors, or motion gestures. These signals are processed

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by a microcontroller and translated into corresponding text, which is then converted into speech using a text-to- speech module. The proposed system is low-cost, portable, and user-friendly, making it suitable for daily communication. By leveraging Morse code as an alternative communication medium, the system enables speech-impaired individuals to interact more effectively with society, thereby improving their independence and quality of life.

196. MULTILINGUAL ENSEMBLE CAUSAL-XAI AND GENAI ADVISORY SYSTEM FOR DIGITAL CROP DISEASE DETECTION, DIAGNOSIS, AND DECISION SUPPORT

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Accurate and early detection of crop diseases is es- sential for improving agricultural productivity and ensuring food security. Deep learning models have demonstrated encouraging outcomes in the classification of plant diseases. However, the majority of current methodologies operate as black-box systems, without the ability to offer interpretable, multilingual, and actionable decision support for farmers. This research presents a Multilingual Ensemble Framework that amalgamates vision- based disease detection, Causal Explainable Artificial Intelli- gence (Causal-XAI), and Generative Advisory Intelligence for autonomous crop disease diagnosis and decision support. To make categorisation more reliable under different crop circumstances, a group of convolutional and transformer-based models is used. Causal-XAI approaches are employed to discern disease-specific visual cues by causal reasoning instead of correlation-based explanations, hence enhancing transparency and trust. Also, a generative advisory module gives recommendations for treating and preventing diseases that are aware of the situation and can be read in many languages. Experimental results show that the suggested framework works well for real-world precision agricul- ture applications by making it more accurate, understandable, and useful.

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197. A FEDERATED GAN-AUGMENTED LSTM FRAMEWORK FOR PRIVACY-PRESERVING CROSS-BANK FRAUD DETECTION

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The quick growth of digital banking has made it much easier for criminals to commit fraud, which is a big threat to banks all over the world. Traditional centralized machine learning systems need banks to combine their raw transaction information, which creates serious concerns regarding the protection of consumer data. To solve this problem, we suggest a Federated GAN-Augmented LSTM architecture that lets numerous institutions find fraud while keeping people's personal information safe. Every institution that takes part in our plan trains its own local Generative Adversarial Network to make realistic fake fraud samples. Then, they use the new dataset to develop an LSTM classifier. Federated Averaging over 100 communication rounds, with five simulated bank customers, is used by a central aggregate server to periodically reconcile these local models. An empirical test on the European credit card benchmark dataset, which has 284,807 transactions, only 0.172% of which are fraudulent, shows that our Federated GAN-LSTM does about 9% better in recall and 7% better in F1-score than both standard centralized and vanilla federated baselines. The results confirm that incorporating GAN-driven data augmentation into a federated training pipeline significantly enhances fraud detection while completely preserving client data privacy.

198. CAREFIT: AN AI-POWERED EMOTION-AWARE HEALTH ASSISTANT WITH METABOLIC INTELLIGENCE MODULE

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Non-communicable diseases (NCDs) account for approximately 74% of global deaths, with PCOD, Type 2 diabetes, and thyroid disorders disproportionately affecting India's younger population. This paper presents CareFit, a culturally adaptive AI health assistant built around a novel Metabolic Intelligence Module (MIM). The system integrates real- time facial emotion recognition, Tamil-language voice interaction, a six-agent AI ecosystem, and IoT-simulated physiological streams to compute a personalised Metabolic Score (0–100). CareFit delivers adaptive nutrition guidance, mood-driven UI theming, smart reminders, and Pranayamam-based breathing interventions, forming a clinically informed and culturally sensitive digital wellness solution.

199. VOICE ACTIVATED PRESCRIPTION USING NATURAL LANGUAGE UNDERSTANDING

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Background and objective: Prescription-based medication errors have been a common problem in the health care industry for many years and are mostly brought about by poor doctor handwriting, missings or mistakes in communication among doctors and pharmacists. They may cause treatments to be delayed, medicines to be administered inappropriately, and patient safety to be compromised. To combat this, the project offers a speech- recognition and NLU-based voice-prescription generation system to automate and standardize prescription writing. The goal is to reduce human error, automate the clinical workflow, and provide a hands-free, streamlined process of generating prescriptions, which is most beneficial in high-volume or rural healthcare environments. Data and methodology: The platform makes use of an Automatic Speech Recognition (ASR) pipeline within the form of a Recurrent Neural Network Transducer (RNNT) model for accurate voice-to-text transscription. Following transscription, the text is subjected to NLU tasks such as intent identification and entity recognition. These tasks are performed by transformer-based models such as LLaMA3-8B for general medical context understanding and a biomedical domain-specific Named Entity Recognition (NER) model to identify drug names appropriately, symptom, dose, frequency, and duration. The front-end is developed in React.js and back-end Python libraries for generating PDF output and sending the output as emails. An efficient workflow allows physicians to capture speech, read back the transcript, recognize prominent medical entities, and generate a professionally typed script. Results and discussion: Performance assessment found that transformer models were way ahead of traditional approaches in transcription accuracy and medical entity recognition. The LLaMA3 model performed close to error-free in terms of precision, recall, F1-score, and accuracy, with high intent classification and slot filling. The system was also evaluated in real-world settings and responded with low latency and high usability in a range of clinical scenarios. In comparison to normal prescription practice, the voice-based system minimized transcription time, offered clarity, and minimized error in documentation. The official electronic output in PDF format encourages consistency and future integration in electronic health systems.

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200. ROS-INTEGRATED ROBOTIC ARM WITH DEEP LEARNING FOR ADAPTIVE OBJECT DETECTION AND INTELLIGENT SORTING

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Robots in factories now face dirtier, more chaotic tasks than they used to - making steady sensing and handling tough. This study presents a robot arm built on ROS that uses deep learning to spot items plus sorts them instantly. While most setups stick to one confidence level and unchanging grab settings after launch, ours adjusts while working. Five pieces make this possible. Brightness shifts or crowded scenes. The confidence adjuster tweaks detection limits live. Each failed or successful pick trains a background process that fine-tunes camera and arm alignment over time. What to lift and how firmly depends on object type plus current detection certainty - the grasp planner handles these choices. A running score called TCI shapes behavior: high trust means swift moves, low trust brings caution. If someone walks near, movement slows automatically, paths grow wider - safety without stopping. Performance stays sharp even when surroundings drift from ideal. From the start, it works using regular ROS systems while fitting right into typical robot arm setups. During trials, performance jumped - especially when lights were low, grabs needed checking, alignment slipped, or people moved nearby. Robots using ROS often rely on deep learning to spot objects. Instead of guessing, they calculate how sure they are about what they see. Grasp planning adjusts based on that certainty level. YOLOv8 helps identify items quickly within the system. MoveIt manages motion while avoiding obstacles. Confidence scores shift when new visual data arrives. Humans step in only if uncertainty rises too high. Feedback loops tweak robot choices over time. Working together means machines adapt without taking control. Trust between person and robot builds through small corrections. Each decision weighs past results against current inputs. Success shows not in speed but in quiet reliability.

201. PROLINECHECK: AN INTELLIGENT ML-AUGMENTED DIGITAL TWIN FRAMEWORK FOR REAL-TIME PRODUCTION LINE EFFICIENCY MONITORING AND PREDICTIVE CONTROL

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Manufacturing floors today are under constant pressure — cut downtime, tighten quality, squeeze more out of every machine. The monitoring tools most facilities still rely on don't really meet that challenge. Rule-based alerts and scheduled inspection rounds were never designed to track the kind of fast-moving, interconnected dynamics that play out across a live production line, and the gaps they leave tend to show up at the worst possible moments. This paper introduces PROLINECHECK, a Digital Twin framework that pairs real-time sensor data with machine learning to keep a continuous, intelligent eye on production line performance. At its core is a hybrid LSTM-XGBoost model that tracks OEE trends over time and flags deterioration before it turns into a stoppage. Running alongside it is an Isolation Forest anomaly detector that picks up on irregular machine behavior without needing a library of past faults to learn from. The whole system communicates through OPC UA — not just reading from machines, but writing back to them — which is what makes it a genuine Digital Twin rather than a

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passive monitor. Built to work across industries, PROLINECHECK is first applied here to stone manufacturing, a sector that has been slow to adopt digital tools despite being well-suited for them.

202. LRFS: ONLINE SHOPPERS BEHAVIOR-BASED EFFICIENT CUSTOMER SEGMENTATION MODEL

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This In the realm of digital commerce, online shopping has witnessed unprecedented growth globally, becoming a cornerstone of modern consumer behavior. This research introduces an advanced customer segmentation model, named LRFS, which builds upon the traditional LRF framework (Length of Relationship, Recency of Purchase, and Frequency of Purchase), specifically tailored for the e-commerce sector. The innovation of the LRFS model lies in the integration of a novel component, ‘‘S’’, which quantifies the Staying Rate relative to the revenue generated by customers on a specific website. This addition aims to enhance the granularity and efficacy of customer segmentation by leveraging data extracted from Google Analytics. To operationalize the LRFS model, this study employs two renowned clustering algorithms, K-Means and K-Medoids, analyzing the dataset through the lens of three distinct dimensionality reduction techniques: PCA (Principal Component Analysis), t-SNE (t-Distributed Stochastic Neighbor Embedding), and Autoencoder. This methodological approach facilitates a robust comparative analysis between the LRFS model and its predecessors — LR, LF, and LRF — utilizing K-Means clustering to evaluate the precision of customer cluster assignments. The empirical findings of this research underscore the superiority of the LRFS model in achieving more accurate and insightful customer segmentation. understanding of the online customer base. Through the development and application of the LRFS model, this study contributes significantly to the field of e-commerce by providing a more nuanced tool for businesses to tailor their marketing initiatives, ensuring alignment with the evolving preferences and behaviors of their online clientele

203. SMART SPEAK: A SUSTAINABLE AI COACH FOR PUBLIC SPEAKING

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The Sustainable AI Practice Coach introduces a scalable and sustainable framework built for autonomous speaking skills development, bridging the gap between traditional coaching and data driven

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skill achievement. By leveraging a resource efficient system architecture, the platform captures vocal input and uses Pydub [13] for streamlined preprocessing, ensuring data integrity. The backend utilizes Cloudinary [16] and Firebase Firestore [17] for optimized data lifecycle management, enabling seamless storage and retrieval. The core analytical engine integrates OpenAI's Whisper [11] for robust transcription along with Transformers [12] based models for unbiased sentiment evaluation. This pipeline accurately extracts critical performance indicators including Words Per Minute (WPM), pitch variance, confidence scoring, mistakes, improvements, suggestions and filler word frequency providing a long term, sustainable methodology for tracking progress. By delivering immediate, actionable insights through a dynamic dashboard, the system allows users to engage in systematic, self-sustaining adjustment, effectively making high level communication training through a continuing and accessible digital environment.

204. DISTANCE-BASED MULTILAYER PERCEPTRON FOR HINDI SIGN LANGUAGE RECOGNITION USING HAND LANDMARKS

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Sign language recognition has historically concentrated on converting gestures into English letters or words, frequently neglecting the extensive linguistic diversity present in native scripts like Devanagari. To fill this gap, we suggest a new Hindi Alphabet Recognition System made just for the Devanagari script. Using MediaPipe's ability to track hands in real time, our system records detailed 3D hand landmarks to correctly interpret hand gestures that correspond to Hindi letters. We present a distinctive dataset consisting of 1000 samples per class, rendering it one of the most extensive Hindi sign language datasets available to date. The extracted hand landmarks are normalized and turned into distance-based features through pairwise Euclidean computations, which makes feature vectors that are very good at distinguishing between different types of data. A deep learning model based on a Multi-Layer Perceptron (MLP) takes these vectors and classifies them with 99.67% accuracy, which is the best in the field. We also use OpenAI's ChatGPT for real-time grammar correction to make the system easier to use and more accessible. This makes sure that the translated Hindi sentences are not only correct at the letter level, but also grammatically correct and sound natural. Our system is a complete solution for translating Hindi sign language to text. It uses gesture recognition, MLP-based classification, and AI-driven language processing to do this. It is also the first step toward making real-time Indian Sign Language communication tools.

205. DESIGN AND DEVELOPMENT OF A SOLAR PANEL CLEANING ROBOT

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Dust accumulation on photovoltaic panels signifi- cantly reduces their efficiency, leading to energy losses of up to 40%. This paper presents the design and development of a lightweight semi-autonomous solar panel cleaning robot for rooftop applications. The system integrates a rotating brush mechanism, minimal water spray system, and wireless control using an HC-12 module. Mechanical analysis including load, fric- tion, torque, and power consumption is performed. Experimental results show a cleaning efficiency of 80–85%, with low power consumption and reduced weight compared to existing systems. The proposed robot provides a cost-effective and energy-efficient solution for maintaining solar panel performance.

206. MUSIC RECOMMENDATION SYSTEM FOR MEDITATION & RELAXATION USING AI AND ML

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In today's fast-paced digital environment, stress, anxiety, and mental fatigue have become major challenges affecting human well-being. Music plays a critical role in enhancing meditation experiences by influencing mood, attention, and physiological responses. This paper proposes an AI-based Music Recommendation System for Meditation and Relaxation that integrates mood detection, user preference modeling, and deep learning-based recommendation techniques. The system captures both short-term emotional state and long-term listening behavior to generate personalized meditation music recommendations. Furthermore, music features such as tempo, rhythm, frequency spectrum, and energy level are analyzed to ensure therapeutic suitability. The experimental findings indicate that considering both the user's emotional state and listening behavior leads to more meaningful and context-aware music recommendations. By adapting to how users feel during meditation sessions, the system delivers playlists that are better aligned with relaxation goals and overall user expectations. This approach highlights the potential of AI-driven personalization in supporting digital mental wellness solutions and advancing the development of intelligent recommendation systems designed specifically for stress management and emotional well-being.

207. LTE-TO-5G NETWORK MIGRATION FOR METROPOLITAN SMART CITIES: ARCHITECTURE, PERFORMANCE ANALYSIS, AND DEPLOYMENT FRAMEWORK

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This paper presents a comprehensive framework for migrating metropolitan cellular infrastructure from Long-Term Evolution (LTE) networks to Fifth Generation (5G) standalone (SA) architecture, with a focus on smart city application requirements. We propose a phased five-stage deployment model that minimises service disruption while enabling progressive capability enhancement across enhanced Mobile Broadband (eMBB), Ultra-Reliable Low- Latency Communications (URLLC), and massive Machine-Type Communications (mMTC) use cases. Through simulation using ns-3 and real-world pilot data from three metropolitan testbeds (Chennai, Rotterdam, and Nairobi), we demonstrate that our migration framework achieves end-to-end latency reductions of 93.8%, throughput improvements of 56×, and energy-per-bit gains of 93.3% over baseline LTE deployments. The proposed architecture integrates Software-Defined Networking (SDN), Network Function Virtualisation (NFV), and AI-driven self-organising network (SON) management to support up to 1 million connected IoT devices per km2.

208. LEXCONNECT: LEGAL AID & CASE MANAGEMENT PLATFORM VEDANG DESHMUKH

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LexConnect is a web-based, integrated legal assistance and case management platform designed to enhance accessibility, transparency, and efficiency in legal services. Many individuals face significant challenges, including limited legal awareness, difficulty in identifying reliable legal professionals, and a lack of transparency regarding case progress. This project addresses these issues by providing a unified, multi-portal system that connects citizens and lawyers through dedicated, secure interfaces.

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The platform incorporates sophisticated lawyer discovery and matching mechanism, consultation scheduling, centralized case management, and secure document handling. To ensure the integrity and privacy of sensitive legal data, the system implements robust Role-Based Access Control (RBAC), ensuring that only authorized stakeholders can access specific case information. Technically, LexConnect is developed as a full-stack application using a Django-based backend and a React-powered frontend, ensuring high scalability and a responsive user experience. By digitizing traditional legal workflows and enabling direct, real-time communication between clients and legal experts, LexConnect aims to reduce procedural delays, improve legal literacy, and democratize access to justice through a secure and efficient digital ecosystem.

209. MINDSPIRE - WELLNESS MEETS VR

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This paper presents the design, implementation, and therapeutic potential of the MindSpire - Mental wellness game, a Unity-based interactive application developed for mentaltherapy and rehabilitation. By transforming repetitive motor exercises into engaging gameplay, the project supports upper limb mobility and fine motor skill recovery. We discuss the modular project structure, mechanics designed for therapy, and technical choices that ensure adaptability and sustained patient engagement. This work demonstrates how game technology can increase accessibility, motivation, and quantitative progress tracking in physiotherapy contexts.

210. A COMPREHENSIVE APPROACH TO CYBERBULLYING CLASSIFICATION AND PREDICTION IN SOCIAL NETWORKS

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This paper presents a comprehensive framework for cyberbullying classification and prediction within social networks, focusing on Facebook. The proposed system uses a two-phase methodology: the Group Identification Phase (GIP) and the Risk Assessment Phase (RAP). In GIP, users are clustered into demographic groups (by gender and age). In RAP, cyberbullying risk is assessed within each group using keyword-based filtering and machine learning. Two models are evaluated: Support Vector Machine with Radial Basis Function (SVM-RBF) and an Intention Model, implemented in Java using the Weka toolkit. SVM-RBF achieves 93.57% accuracy, 93.35% precision, 93.85% recall, and 93.60% F-measure. The Intention Model achieves 81.69% accuracy. Results demonstrate the efficacy of demographic clustering combined with ML for proactive cyberbullying detection.

211. GRAD-CAM GUIDED SAM PROMPTING WITH UNCERTAINTY-AWARE MULTI-MODEL FUSION FOR EXPLAINABLE BRAIN TUMOR DIAGNOSIS

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Automated brain tumor diagnosis from magnetic resonance imaging remains one of the more demanding problems in clinical AI, where both speed and trustworthiness are non- negotiable. Existing deep learning classifiers typically report a single probability score, offer no spatial explanation, and give no indication of when a prediction should not be trusted. This paper presents a multi-model fusion pipeline that resolves all three limitations. The system chains EfficientNet-B0 with Grad- CAM heatmap generation, YOLOv10 detection, MobileSAM segmentation, Monte Carlo Dropout uncertainty estimation, and a LLaMA 3.1 conversational assistant into one end-to-end infer- ence pass. The central contribution is Grad-CAM guided SAM prompting, which uses class activation map hotspot coordinates as spatial point prompts for MobileSAM, raising segmentation IoU from 0.58 to 0.74 over random prompting. A four-tier reliability system derived from twenty stochastic forward passes flags uncertain predictions for radiologist review, achieving a 37.8 percentage-point accuracy spread between tiers. Automated WHO grade and volumetric estimation are derived from the SAM mask. Evaluated on 1,600 test scans the system reaches 95.5% overall accuracy, macro F1 of 0.954, and perfect recall on No- Tumor and Pituitary classes. It is the only published method si- multaneously providing segmentation, explainability, uncertainty scoring, volumetrics, and AI-assisted clinical dialogue.

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212. BRAIN TUMOR DETECTION AND CLASSIFICATION IN MRI USING DEEP LEARNING

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The detection of brain tumors using Magnetic Resonance Imaging (MRI) is a significant area of research in the field of medical image processing and artificial intelligence, where deep learning algorithms can be utilized to enhance the accuracy of diagnosis and automation. The current manual process of analyzing MRI images is a time-consuming task that requires expert knowledge from radiologists, resulting in potential delays in diagnosis and inconsistencies in clinical outputs, making the early detection of brain tumors a difficult task. The current state of the art is based on traditional image processing and machine learning algorithms with manual feature extraction and classifiers such as Support Vector Machines (SVM) and K-Nearest Neighbors (KNN). Although these algorithms are very helpful, they have difficulties in dealing with the complex and non-linear patterns of brain tumors. These algorithms have problems generalizing, are prone to noise, and tend to lose accuracy when the MRI images come from similar classes of tumors. In order to address these issues, this research project aims to develop a brain tumor detection and classification system using a Convolutional Neural Network (CNN) with transfer learning from the MobileNetV2 model. This system will be able to automatically identify and classify the MRI images into four classes: Glioma, Meningioma, Pituitary Tumor, and No Tumor. In addition, basic image processing operations are performed to provide tumor segmentation overlays and estimate tumor area for enhanced interpretability. The proposed system has the capability to provide higher accuracy, robustness, and fast real-time predictions with a user-friendly web interface. Future enhancements of the proposed system can be achieved by incorporating larger clinical datasets, 3D MRI analysis, and advanced deep learning-based segmentation models.

213. SOLAR FLARE ANALYSIS USING DEEP LEARNING: INTEGRATING ENERGY EVOLUTION WITH MULTIMODAL SOLAR IMAGING

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The analysis of solar flares still feels like a mystery for space weather teams. Some methods use physics rules and make sense logically, but they don’t always forecast right. Others use AI and do better on scores, but they don’t understand what’s really going on. We’re combining both with a new system that builds in MHD rules directly into deep learning. It uses 3D- ResNet CNNs trained on SDO/HMI

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magnetogram data, a 3D EfficientNet that handles nine SDO/AIA EUV channels, and a physics-based encoder tracking magnetic helicity flux, free energy, twist number, and decay index. An LSTM layer keeps MHD energy changes consistent over time. Cross-attention lets the model focus only on features tied to eruptions. Instead of using fixed cutoffs, we treat flare prediction as a smooth regression of GOES X-ray flux across the variety - keeping all the detail from the full range. The model uses limb-flare data with advective Flux Transport to predict magnetic fields on the far side, where photospheric views can't reach. On Solar Cycle 24/25 data, it hits a true Statistic value will be 0.85 for flares at lower range or stronger - better than the 0.83 from transformer models and cuts false alarms at the limb by 45%.

214. AI-POWERED BUILDING ENERGY CONSUMPTION PREDICTION AND HVAC OPTIMIZATION USING IOT SENSOR DATA AND REINFORCEMENT LEARNING

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Energy consumption in modern buildings has increased significantly due to rapid urbanization and the growing demand for indoor comfort. Heating, ventilation, and air conditioning (HVAC) systems contribute a major portion of this energy usage. Traditional energy management systems mainly focus on monitoring and reporting, with limited capability for prediction and intelligent control. This results in inefficient energy usage and reduced operational performance. This paper proposes an intelligent building energy management system that integrates Internet of Things (IoT) sensing, deep learning-based prediction, and reinforcement learning-based HVAC optimization. Real-time environmental parameters such as temperature, humidity, occupancy, and energy consumption are collected using IoT sensors. A Long Short-Term Memory (LSTM) model is used to predict short-term energy consumption. The predicted values are utilized by a reinforcement learning (RL) agent to determine optimal HVAC control actions. The system continuously learns and adapts to changing environmental conditions. Experimental results show that the proposed system improves energy efficiency and system adaptability compared to traditional rule-based approaches.

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215. TRAFFIC MANAGEMENT USING MACHINE LEARNING–ASSISTED DATA INTELLIGENCE

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Although many cities have been impacted by urban traffic congestion for decades and it continues to be one of the biggest problems impacting urban commuters, because of increasing travel times, increased fuel consumption and increased air pollution, most current traffic management systems do not consider all three steps (monitoring, predicting and controlling) when managing traffic; therefore, there is limited flexibility in responding to changing traffic conditions. AlertX, a complete traffic management system that combines real-time detection, real-time forecasting, and adaptive traffic light control in a single module has been developed. The main contribution of this project is to bring together the detection, forecasting and control elements into an end-to-end system with low delay capable of being deployed practically without the need to install any new infrastructure. AlertX uses advanced computer vision technology to detect and classify each vehicle at lane level and uses ensemble machine learning methods such as linear regression, random forest and xgboost to forecast traffic flow and congestion. An adaptive traffic light timing element controls the duration of green lights in response to real-time traffic congestion information to help increase efficiency at intersections. Experiments were conducted that showed that the forecasting method used was accurate 89.3% of the time with a Mean Absolute Error (MAE) of approximately 4.2 vehicles per lane. In addition, experiments demonstrated that AlertX can reduce average wait time at intersections by up to 22% as compared to traditional fixed timing control while providing a mean processing delay of 45ms allowing for real time decision making.

216. VISIONSENSE: INTELLIGENT AUDIO-GUIDED SYSTEM FOR BLIND NAVIGATION

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Living in the world without the aid of sight is always full of challenges, especially in unfamiliar and changing environments. The intelligent assistive system is meant for the visually impaired and aims at empowering them by providing them with real-time awareness of their surroundings and environment. The system is based on the concept of a smart assistant that is always aware of the surroundings and environment and can detect objects and obstacles in the area. Instead of simply alerting the impaired of obstacles in the environment, the system can differentiate between normal objects and significant objects in the environment. After the detection of significant objects or obstacles in the environment, the system provides instant feedback to the impaired using a combination of vibrating motors, voice, and visual display. The proposed system is based on the concept of closing the gap between the impaired and the environment by converting the surroundings and environment into useful guidance for the impaired. The proposed solution is based on the concept of empowering the impaired and promoting self-reliance and accessibility for the visually impaired in the contemporary world.

217. CAREER BREAKS AND THEIR IMPACT ON CAREER SATISFACTION AMONG WOMEN EMPLOYEES IN THE IT SECTOR

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This study investigates how career breaks affect career fulfillment for women working in Information Technology (IT) jobs by examining how organizational support functions as a mediating factor that affects their overall career satisfaction. Women face major difficulties when they need to stop their careers because of family duties and societal demands which follow them throughout their professional lives. This study used a structured questionnaire to gather primary data from 200 female IT sector employees. This study used statistical and machine learning methods to study the relationship between career break effects and organizational backing and career achievement and professional wellbeing. The results show that career breaks do not directly impact professional outcomes because organizational support functions as the primary mediating factor. The study found that organizational support positively affects both career satisfaction and career well-being of employees. The study found that Naive Bayes outperformed all other predictive models because it showed that multiple factors interact to determine career outcomes instead of showing direct connections between variables. The study shows that organizational practices which provide flexible work options and new skill development and managerial support make a positive impact on employees who return from breaks to their work. The study shows that organizations need to implement policies which create an inclusive environment to

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support women employees who return from career breaks in order to enhance their career satisfaction in the active IT industry.

218. LLM-AUGMENTED ENSEMBLE LEARNING FOR EARLY PREDICTION OF CHRONIC DISEASES USING ELECTRONIC HEALTH RECORDS

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Chronic illnesses like diabetes and cardiovascular diseases are significant in the global health burden, and predicting risks early can be a significant way of enhancing clinical outcomes and cutting down on the healthcare costs in the long term. The current machine learning methods of Electronic Health Records (EHRs) use structured clinical variables and tend to ignore the contextual information that is inherent in unstructured medical stories. It is this limitation that points to a serious research gap in multi-modal predictive modeling which takes both quantitative and semantic data into account. The present study suggests an ensemble learning model enhanced with an LLM to predict chronic diseases at an early stage based on the structured and unstructured EHR data. Formatted characteristics such as demographic features, laboratory data, and vital signs are jointly represented with contextual embeddings obtained via clinical notes with the help of a pre-trained Large Language Model (LLM). The fused feature space is optimized through a stacking-based ensemble comprising Random Forest, XGBoost, and LightGBM classifiers. It is tested on accuracy, precision, recall, F1-score, and ROC-AUC and ablation analysis to determine the value of the representation made by the LLM. The results of the experiment support that when semantic embeddings are combined with ensemble learning,

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predictive performance and generalization are better than those of structured-only models. The findings reveal that the multi-modal modeling with LLM-enhanced can be interpreted and scaled to offer an efficient method of intelligent early risk detection of disease in healthcare systems.

219. AN ADAPTIVE BOOTH-DIGIT SIGNIFICANCE BASED APPROXIMATE RADIX-4 MULTIPLIER

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Approximate computing has emerged as an effective technique for reducing power consumption and hardware complexity in error-resilient digital systems. Among arithmetic units, Booth multipliers are widely adopted due to their partial-product reduction capability; however, conventional approximation strategies often apply uniform truncation or operand-level simplifications that may introduce unnecessary error or redundant switching activity. This work presents a Booth-digit-aware adaptive approximate radix-4 multiplier that selectively applies partial-product truncation based on digit significance and runtime MSB activity detection. The proposed architecture incorporates two configurable parameters to control 2 approximation strength and employs bounded truncation with bias compensation to mitigate deterministic error. Unlike static approximation schemes, the multiplier dynamically adjusts truncation levels depending on the significance of the most active Booth digits, enabling improved energy–accuracy trade-off. The design is implemented in Verilog HDL and functionally verified using signed arithmetic test vectors. Logic synthesis targeting a 90 nm standard-cell library demonstrates significant reductions in cell count, power consumption, and critical-path delay compared to representative decoder-reduction and operand-truncation-based Booth architectures. The results confirm that Booth-digit-guided adaptive approximation provides an efficient architectural strategy for low-power combinational datapaths in VLSI systems.

220. DESIGN AND IMPLEMENTATION OF SECURE WIRELESS NETWORK DEPLOYMENT WITH SRX300

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Wireless networking has become a fundamental component of modern organizations and educational institutions, enabling users to access the internet and communicate efficiently. However, these networks are often vulnerable to several security challenges, including unauthorized device access and the presence of rogue access points. This work focuses on the design and deployment of a secure wireless network using Juniper networking technologies such as the SRX300 firewall, EX series switches, and Mist AP32/AP63 wireless access points. Network segmentation is implemented using Virtual Local Area Networks (VLANs) to separate traffic and enhance overall network security and management. A dedicated guest wireless network is also configured through the Juniper Mist Cloud platform using a captive portal authentication mechanism, which provides controlled access for external users. The SRX300 firewall is used to enforce security policies that regulate network traffic and restrict unauthorized activities. Furthermore, advanced security features including rogue access point detection is integrated to identify and analyze potential wireless threats. The developed system demonstrates an effective solution for establishing a secure, scalable, and well-managed enterprise wireless network environment.

221. SMART IOT-BASED MULTI-HAZARD DETECTION AND AUTOMATED SAFETY RESPONSE SYSTEM FOR IN-VEHICLE ENVIRONMENTS USING ESP8266

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Passenger safety inside vehicles is increasingly challenged by the presence of invisible yet potentially life- threatening hazards such as combustible gas leakage, fire incidents, and extreme environmental conditions. These risks are particularly critical in enclosed vehicle cabins where harmful gases can accumulate rapidly without immediate detection. To address this issue, this paper presents a smart IoT-based in-vehicle hazard detection and automated safety response system built using the NodeMCU ESP8266 microcontroller.The proposed system integrates multiple sensors, including an MQ-6 gas sensor for detecting LPG and combustible gases, a DHT11 sensor for monitoring temperature and humidity, and a flame sensor for identifying fire hazards. The system continuously analyzes sensor data and compares it against predefined safety thresholds. When any abnormal condition is detected, an automatic multi-level safety mechanism is triggered. This includes activating a ventilation fan using a DC motor to remove contaminated air, opening the vehicle window using a servo motor to allow fresh air circulation, and generating an audible alert through a buzzer to warn occupants. In addition to local safety responses, the system leverages the built-in Wi-Fi capability of the ESP8266 to transmit real-time sensor data and alert notifications to cloud platforms such as ThingSpeak and Blynk. This enables remote monitoring and timely intervention by vehicle owners or fleet operators. Experimental results demonstrate reliable hazard detection, quick system response, and stable cloud communication, confirming the effectiveness of the proposed solution.The developed system offers a cost-effective, scalable, and practical approach to enhancing in-vehicle safety by combining multi-sensor monitoring, automated response mechanisms, and IoT-based remote accessibility.

222. TOWARDS SUSTAINABILITY: INNOVATIONS AND ENVIRONMENTAL IMPACTS IN LEATHER MANUFACTURING FOR THE TEXTILE INDUSTRY

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The textile industry can utilise all kinds of resources available in nature, from animals to plants and to microbes. But evolution of textile materials has intensely hampered nature as well. From very ancient times people are attracted by animal leather and fur for their aesthetics and practical qualities, but in recent years, these materials have become a subject of debate due to increasing awareness of ethical rights and concerns surrounding animal welfare and environmental impact. If we talk about eco-friendly, cruelty-free sustainable fashion then plant-based leather, waste-based leather offers stylish alternatives to traditional leather. This review article discusses about the real-world applications of scalability, cost analysis of the products. This also talks about how sustainable approach of making bio-leathers connects to carbon neutrality, SDG12, and SDG13. This article compares productivity, processing, new approaches and environmental impact related to all types of leathers. This article also deals with life cycle assessment (LCA) of leather industry.

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223. SOLAROPS: AN INTEGRATED FULL-STACK PHOTOVOLTAIC SIMULATION PLATFORM WITH PHYSICS-BASED ENERGY MODELING, FARM LAYOUT OPTIMIZATION, AND INTERACTIVE 3D VISUALIZATION

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The worldwide shift toward renewable energy sources requires scalable and precise simulation paradigms for utility-scale photovoltaic (PV) system design. As solar projects expand into complex topologies and adopt multi-megawatt con- figurations, static and simplified modeling approaches are insuf- ficient to accurately represent system behavior, layout efficiency, and energy yield. This paper introduces SolarOps, an integrated full-stack solar engineering platform that combines a high-fidelity Python physics engine, a Flask RESTful API backend, and an interactive Three.js-based 3D visualization frontend into a unified, browser-accessible simulation environment. The physics engine ingests multi-year historical meteorological data from the NASA POWER database and processes it through a rigorously sequential, modular pipeline encompassing solar position com- putation, irradiance transposition using the isotropic sky model with dynamic ground albedo, geometric row-to-row shading analysis, Nominal Operating Cell Temperature (NOCT)-based thermal modeling, and cascaded AC power conversion. A scalable farm-simulation layer evaluates three distinct industrial land- use topologies—Standard, East-West, and Staggered—enabling multi-megawatt yield estimation from first-principles geometry. A deterministic bounded grid-search optimization module guar- antees discovery of the globally optimal tilt and azimuth configu- ration without the convergence risk of stochastic metaheuristics. The frontend delivers real-time 3D visualization of single panels, utility-scale arrays, and optimized configurations using WebGL- accelerated rendering with dynamic sun animation, seasonal en- vironment switching, and live scene telemetry. Validation against published literature for Konya, Turkey demonstrates a mean absolute percentage error of approximately 5.20% across all twelve calendar months. SolarOps provides a computationally robust, visually interactive platform for next-generation solar engineering and LCOE optimization.

224. SMART ATTENDANCE AND LATE DETECTION SYSTEM USING GPS LIVE TRACKING

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The Smart Attendance and Late Detection System is a GPS-based real-time web application that tracks students' journeys from home to college. Traditional attendance systems record only binary present or absent status without any visibility into student punctuality or travel patterns. This system addresses that gap by providing live GPS tracking with 60-second update intervals, traffic- aware route calculation using Google Maps Directions API, and a rule-based AI prediction engine that forecasts whether a student will arrive on time or late based on their start time, Google Maps ETA, and historical attendance patterns. The system features three user roles: Student, Faculty, and Admin, each with dedicated dashboards. Students view their live route and receive AI-based punctuality predictions. Faculty monitor all students on a live map and generate reports. The Admin panel provides complete management including adding/removing users, resetting passwords, blocking accounts, marking attendance, and downloading reports. The system is deployed on AWS EC2 with HTTPS encryption and is accessible globally.

225. A MULTIVEHICLE GNSS SPOOF DETECTION FRAMEWORK USING MOTION FEATURES AND LSTM NETWORKS

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Global navigation satellite systems are widely used to determine where vehicles are in transportation systems. However, they can be fooled by spoofing attacks, which can be bad for vehicle safety. This paper about discusses a way to detect these spoofing attacks via Global Navigation Satellite Systems. It looks at how vehicles move and uses learning to determine if something is wrong. The idea is to check things such as if the Global Navigation Satellite Systems data do not match what the vehicle is actually doing, if the vehicle's path is not what it should be, or if the speed is not right. Some common methods, like random forest and support vector machine, are used to compare the results. A special kind of learning called long short-term memory is used to understand what happens over time. This new way of detecting spoofing attacks was made via Python and several special libraries called TensorFlow and Scikit-learn. When it was tested, it was able to find spoofing attacks approximately 87.8% of the time, and it only approximately 4s to do so. If it finds a spoofing attack, it stops using the Global Navigation Satellite Systems data.

226. DETECTION OF NITROGEN DEFICIENCY IN WHEAT LEAVES USING IMAGE PROCESSING AND CONVOLUTIONAL NEURAL NETWORKS

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Wheat feeds billions, and even small shortages of nutrients, especially nitrogen, sharply cut yields. Detecting nitrogen stress early is therefore crucial, yet current methods like walking through fields looking for visual checks or sending samples to a lab are slow, expensive, and out of reach for many growers. This paper presents a practical, image-based approach that uses Convolutional Neural Networks to spot nitrogen deficiency from photos of wheat leaves taken with an ordinary smartphone. We clean and standardize the images (noise removal, color and contrast normalization, and simple segmentation to isolate leaf area), extract visual cues with a CNN, and classify each sample as either healthy or nitrogen-deficient. The result is a fast, automated decision aid that reduces dependence on manual inspection and lab work. The pipeline is intentionally lightweight so it can scale across farms and, with further training, be adapted to identify shortages of other nutrients - a step toward making precision agronomy usable by more farmers.

227. ADAPTIVE INTRUSION MONITORING THROUGH AI

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The primary goal of the current research is to en- hance the timely detection of attacks, which have ever-increasing significance as cyber threats evolve with time.Although there have been various approaches in the past to detect malicious behavior and block the relevant traffic, we propose here the design of an Artificial Intelligence-powered Intrusion Detection System (IDS) that aims to detect unusual and suspicious behavior within a network. This system leverages the power of AI using techniques like behavior modeling, anomaly detection, and adaptive learning to identify and acknowledge new and developing threats better. Establish a profile of typical network behavior and raise alerts if anything untoward occurs. We focus essentially on maximizing the accuracy and detection speed without carrying out auto-block at this level. For implementing top-grade security practices, the system uses guidelines and best practices from ISO 27033, NIST 800- 94, and the CIS Critical Security Controls. It is seen from the outcomes that early warning systems for security have the capability to

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better alert organizations about possible threats much sooner. In doing so, this study reaffirms the indispensable role played by artificial intelligence to make the network defense smarter and progressively intelligent with each passing moment.

228. TEXTURE AND STRUCTURAL IMAGE ANALYSIS FOR FINGERPRINT LIVENESS DETECTION

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Fingerprint biometrics are essentially reliable; therefore, most of the time people use them for identification purposes as well due to the challenge of reproducing fingerprints. However, criminals still discover ways to fool fingerprint biometrics through the use of artificially generated fingerprint replicas. A large number of current methods for detecting fingerprint liveness either use sophisticated and costly hardware sensors or deep learning models that are both computationally intensive; thus, real-time and embedded applications remain yet to be improved in this area. This study proposes a hardware-based static fingerprint liveness detection mechanism that captures the fingerprint image with a dedicated fingerprint sensor to operate on a single fingerprint image. A combination of Speeded Up Robust Features (SURF), Pyramid Histogram of Oriented Gradients (PHOG), and Gabor wavelet-based texture features is used by the proposed system to locate highly discriminative fingerprint characteristics. Principal Component Analysis (PCA) is used to reduce the dimensionality of the feature vectors so as to decrease the computational cost and make the system capable of operating in real time on limited- resource hardware. The hybrid K-Nearest Neighbors (KNN) and RandomForest (RF) methods are used as the classifiers to further significantly improve the robustness and stability of the classification and interpretability of the decision. The created model functions without user interaction, and therefore, it is particularly suitable for forensic investigations and secure authentication systems. The test results show that the proposed method can effectively tell the difference between live

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fingerprints versus the ones generated by spoofs with less latency and higher resistance to unknown spoof materials.

229. A FUSION BASED APPROACH FOR UNDERWATER IMAGE RESTORATION

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Underwater image enhancement is important for many types of maritime research, including; marine exploration, robot design/operation, and surveillance. Underwater environments typically have low contrast due to absorption and scattering of light, which results in distorted color representation and visual noise. A method is proposed using fusion technology to restore almost all aspects of an underwater image. Specifically; a dehazing module that reduces blue-green tones while preserving details, gamma correction which improves visibility in dark areas, denoising performed through a deep learning convolutional neural network (CNN), and fusing the dehazed and denoised images into a single visual representation provides an output image with enhanced characteristics (clearer) than the individual images. Finally, by sharpening edges, fine detail may be more easily seen. The underwater images that were evaluated in the development of this method were taken from the EUVP Dataset and encompassed multiple types of underwater conditions. Based upon the results obtained from the experiments completed, it can be said that the proposed method improved visibility, contrast, and detail in the edge of an image while maintaining the natural colour of an actual underwater scene; thus giving the proposed method a potential for a wide array of practical uses.

230. EMPLOYEE ATTRITION PREDICTION SYSTEM USING DECISION TREE CLASSIFIER AND HR PERFORMANCE METRICS ANALYSIS

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Attrition is a problem in the field of organization since its effect directly influences productivity, sustainability, and finances. Although there has been significant research regarding the ability of machine learning approaches to predict employee turnover, previous methods have focused on maximizing the predictive performance of the model rather than addressing the cost of employee attrition and interpretability issues [1], [2], [3]. In this paper, we introduce a new concept which takes into consideration both problems mentioned above and develops a framework combining predictive models with financial analysis and XAI approach. To accomplish our task, we use various classification methods, such as decision trees, ensemble methods, and support vector machines along with feature selection procedures [4], [5], [21]. Cost-sensitive learning, introduced by B. Zadrozny et al. [13] was used to estimate the cost of possible employee attritions. In addition, to solve black-box modelling problem, an explanation technique – counterfactual explanations was used to reveal important characteristics contributing to employee attrition. Our experiment shows that the presented approach not only provides high accuracy of employee attrition prediction but also is capable of providing understandable and cost-aware recommendations. In this way, we contribute to the development of Human Resources Analytics field [11], [19].

231. AI POWERED SUBURBAN HEATWAVE MAPPING

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Due to the high rate of urbanization and climatic change, heatwaves are becoming increasingly frequent and severe, especially in suburban areas where the changes in land-use and vegetation coverages are causing the buildup of heat locally. Conventional thermal monitoring techniques using satellites usually have a coarse spatial resolution which restricts its usage in identifying small scale changes in temperature and hotspots. The paper suggests an AI-based suburban heatwave mapping system that would combine the multi-source geospatial data collection, such as satellite thermal data, land-use data, vegetation indices, meteorological data, and the IoT sensor data. The model of a thermal super-resolution with the use of deep learning is utilized to increase the spatial resolution of satellite temperature images, which will allow the identification of hotspots of a localized heat source. More ensemble machine learning is used to predict temperature distribution and high-risk zones of heat through integrating environmental and demographic factors. The system also includes a simulation component to assess the possible cooling potential of the urban greening interventions like increased vegetation cover, green roofs and reflective surfaces. The results of experiments indicate that the suggested framework can tremendously raise the accuracy of temperature forecasting and allow assessing the risk of heat at a fine scale in suburban settings. The system offers a scalable decision-support system to urban planners and policymakers to adopt climate resilient measures and overcome the effects of heatwaves in fast growing suburban regions.

232. Q-LESS: AN AI-POWERED SMART PUBLIC DISTRIBUTION SYSTEM AND QUEUE MANAGEMENT FRAMEWORK FOR DIGITAL INDIA

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India Public Distribution System has long been struggling with problems that are frankly difficult to ignore — endless queues, no real- time information for citizens, and a rigid slot structure that simply doesn't adapt to ground realities. When we started working on Q-Less, the motivation was straightforward: what if a ration shop could actually respond to how fast it was serving people, instead of blindly following a fixed schedule? This paper describes the system we built to answer that question. Q-Less is a mobile-first platform developed using React Native and Node.js that lets citizens book pickup slots or request home delivery, while a backend Rule-Based AI Engine continuously monitors shop throughput and adjusts available capacity in real time. We also built in priority handling for senior citizens, a bilingual interface covering English and Tamil, and QR-based digital tokens that can be shared over WhatsApp. The results from our simulation are encouraging — average wait times dropped from around 87 minutes to roughly 23 minutes, and daily beneficiary coverage improved significantly. This paper walks through the architecture, the AI logic, and what we learned building this for a real-world government context.

233. AN INTELLIGENT MENTAL HEALTH CHATBOT USING GENERATIVE AI AND LLMS

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Mental health chat assistants have emerged as accessible tools for providing emotional support and preliminary mental health guidance. However, most existing systems rely on generic large language models that fail to account for individual differences in emotional expression, communication style, and mental health needs. This project proposes a Personalized Prompt Tuning framework for Mental Health Chat Assistants that adapts responses based on user-specific characteristics while preserving privacy and safety.The proposed system utilizes prompt tuning techniques to personalize interactions without retraining the underlying large language model. User profiles are created from conversational context, emotional tone, and preferred response styles, enabling the assistant to dynamically adjust prompts for empathy level, language complexity, coping strategies, and interaction pacing. Sentiment analysis and emotion detection modules are integrated to guide real-time prompt adaptation, ensuring supportive and context-aware responses.The system is evaluated using qualitative and quantitative metrics, including user satisfaction, emotional appropriateness, response relevance, and mental health safety compliance. Experimental results demonstrate that personalized prompt tuning significantly improves user engagement and perceived empathy compared to non-personalized chat assistants. This approach offers a scalable, privacy-preserving solution for enhancing mental health conversational agents without extensive model fine-tuning

234. AUTOMATIC HAND SANITIZER DISPENSER IEEE INTERNATIONAL CONFERENCE

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This paper presents the design and implementation of an automatic hand sanitizer dispenser aimed at improving hygiene and reducing the spread of infectious diseases. The system operates without physical contact by using a sensor to detect the presence of a user's hand and automatically dispensing a controlled amount of sanitizer. The device is built using a microcontroller, sensor module, pump mechanism, and power supply unit, ensuring efficient and reliable performance. The proposed system minimizes wastage of sanitizer and enhances user convenience in public and private environments such as hospitals, schools, offices, and homes. The compact and cost-effective design makes it suitable for widespread adoption. This solution contributes to promoting better health practices and maintaining sanitation standards.

235. CLIP-DISTILLED SHUFFLENETV2 FOR THE EDGE: ULTRA- EFFICIENT IMAGE CAPTIONING AT SUB-0.2 GFLOPS

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The deployment of image captioning models on resource-constrained devices is hindered by excessive computational costs, despite the impressive performance achieved by deep learning approaches. This work introduces a knowledge distillation framework that distills semantic knowledge from a frozen CLIP ViT-B/32 model as a teacher to a lightweight ShuffleNetV2 student encoder integrated with a long short-term memory (LSTM) decoder [1]. Specifically, a framework was employed involving two layers of distillation: feature-level transferring with mean squared error between pooled spatial features representations and task-level learning with caption generation loss. The proposed framework was evaluated on the Flickr30k dataset, where the student model has a 95% reduction in parameters (2.04M vs. 85M+ parameters) while achieving similar performance with BLEU-4 of 18.27%, METEOR of 17.21%, CIDEr of 31.78%. The proposed framework provides practical utility for edge deployment with 5.71 images per second, allowing for the possibility of real-time image caption generation on mobile and embedded devices.

236. TRACK MY BUS: A REAL-TIME BUS TRACKING AND SEAT AVAILABILITY SYSTEM USING GPS AND CLOUD TECHNOLOGIES

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Public bus transportation remains one of the cheapest and most widely utilized modes of travel. However, passengers are often beset with troubles in terms of uncertain times of arrival, the inability to move due to full capacity, and uncertainty over seat availability. These factors lead to an increase in waiting time, dissatisfaction among commuters, and inefficient use of transportation resources. This paper proposes Track My Bus: A real-time bus tracking and seat availability system using GPS and cloud technologies aimed at improving passenger convenience and enhancing operational efficiency in existing public transport systems. The proposed system deploys GPS technology in continuously monitoring the locations of buses and sending real-time data to a centralized server. Dynamic updates of seat availability are done through inputs by the conductor or driver, hence making it compatible with traditional cash-based ticketing methods. It enables passengers to see the live position of buses, along with the estimated arrival time, route information, and the number of available seats, enabling them to decide before boarding. Its architecture consists of a mobile application interface, GPS-enabled tracking units, and a cloud-based database for the processing and visualization of data. Experimental performance evaluation shows that the application decreases waiting time for passengers and improves the accuracy of travel planning. The results show that real-time access to information on the location of buses and their seat occupancy will help passengers make informed decisions and decrease congestion. The paper concludes that Track My Bus is a practical, scalable, and cost-effective remedy to update traditional bus transit systems without changing the existing workflow of operations and hence is very helpful in the infrastructure needed for smart and sustainable public transportation systems.

237. CODESCAN PRO: A SCALABLE MULTI-LANGUAGE STATIC SECURITY ANALYSIS FRAMEWORK USING MICROSERVICES AND LLM-DRIVEN REPORTING

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As the software development has scaled tremendously it has become now a necessity to possess automated, highly dependable and answerable testing of security. The old-outdated Static Application Security Testing (SAST) tools had a high false-positive and non-transparent reporting. The paper below presents a code scan Pro, a security analyser platform platform that will fill this gap by offering a complete stack solution to the problem. It is based on a microservices architecture to scale out simultaneous scanning Python, JavaScript, Java, and C/C++ environments with industry standard tools (Semgrep, Bandit, Cppcheck). Further, it uses a Large Language Model (Llama 3.3 using Groq) to create hand-curated vulnerability data (in the form of executive reports and remediation plans that can be read by humans). We describe the pipeline of asynchronous pipelines in the system, a cloud-native storage, and effectiveness of the LLMs in instantiation of the results of the static analysis.

238. GENAI MUSIC RENDITION – FRAMEWORK FOR CONTROLLABLE SINGER-STYLE GENERATION AND EMOTION CONVERSION

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Computational analysis of Indian Art Music presents unique challenges due to rigid melodic grammars and intricate micro-pitch nuances, known as gamakas. This work introduces a comprehensive deep learning and signal processing framework designed for the analysis, controllable generation, and stylistic transformation of Carnatic music. By integrating four distinct architectural modules, the proposed pipeline bridges the gap between continuous audio signals and discrete musicological structures. First, a Swara Extraction module utilizes theoretical frequency ratios and raga-specific constraints to map polyphonic F0 contours into structured notations while preserving microtonal integrity. Second, a Raga Prediction engine employs the FP-Growth algorithm and Jaccard similarity to discover frequent swara itemsets, enabling highly accurate next-note melodic recommendations and formal raga identification. To address vocal synthesis, a novel Timbre-Conditioned Diffusion Transformer (TC-DiT) is introduced for zero-shot Singer Voice Conversion, leveraging a Res-UNet and self- supervised linguistic encoder to successfully disentangle semantic topologies from vocal identity. Finally, a Swara-Based Emotion Transformation module utilizes time-based acoustic histograms and cosine-similarity raga mappings to execute targeted, frame-by-frame swara replacements. Experimental results demonstrate that this multi-modular approach provides a robust, scalable solution for digital musicology, effectively shifting the affective envelope of a performance while preserving original lyrics and temporal pacing.

239. AI-DRIVEN OPTIMIZATION OF PIEZOELECTRIC ENERGY HARVESTING FROM HUMAN MOVEMENT

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Energy harvesting from human motion has emerged as a promising and sustainable approach for powering wearable electronics and low-power Internet of Things (IoT) devices, eliminating the dependency on conventional battery-based power sources. Piezoelectric materials possess the inherent ability to convert mechanical stress and strain generated by repetitive human movement into usable electrical energy through the direct piezoelectric effect. However, the overall efficiency of such energy harvesting systems varies significantly depending on motion patterns, vibration intensity, excitation frequency, and the physical placement of sensors on the human body. This paper proposes an artificial intelligence (AI) driven optimization framework for piezoelectric energy harvesting from human movement, targeting real-time adaptability and maximized power output across diverse motion scenarios. The proposed system integrates inertial motion sensors, piezo- electric transducers, and machine learning (ML) algorithms to continuously analyze motion patterns and dynamically optimize energy conversion efficiency. A multi-layer feature extraction pipeline is employed to capture time-domain and frequency- domain characteristics of human motion signals. The model pre- dicts optimal harvesting parameters—including load impedance, resonance tuning, and sensor orientation—based on vibration characteristics and movement intensity in real time. A compara- tive evaluation against conventional fixed-parameter piezoelectric harvesting systems is conducted under controlled and real-world motion conditions. Experimental analysis demonstrates that the proposed AI- based optimization approach achieves a significant improvement in energy generation efficiency compared to conventional piezo- electric harvesting systems, with enhanced adaptability across walking, running, and stair-climbing activities. The proposed framework provides a scalable and sustainable solution for self-powered wearable devices, smart health monitoring systems, and edge IoT nodes operating in energy-constrained environments. The results validate the feasibility of integrating intelligent optimization with piezoelectric transduction for next-generation autonomous wearable systems.

240. A STRUCTURED METHODOLOGY FOR DEVELOPING A HOME-MADE FOOD ORDERING WEBSITE USING HTML AND CSS

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This paper presents the design and development of a Food Ordering Web Application using HTML, CSS, and JavaScript to provide a simple and efficient online food ordering platform. The increasing use of web-based food services has created a need for applications that are easy to use and accessible across multiple devices. The proposed system allows users to browse available food items, select preferred dishes, and place orders through a structured and user-friendly interface. HTML is used to define the basic structure of the web pages, while CSS is applied to enhance layout, visual appeal, and responsiveness for both desktop and mobile users. JavaScript is incorporated to support interactive features such as menu updates, order selection, and client-side input validation. The application was tested across different sections to evaluate usability and performance, and the results indicate reduced ordering time and improved accuracy. This project demonstrates the effective use of front-end web technologies in developing a functional food ordering system and highlights their importance in improving user experience within the food service industry.

241. MULTI-MODEL ENERGY CONSUMPTION ANOMALY DETECTION USING RECONSTRUCTION-BASED DEEP LEARNING AND TIME-SERIES ANALYSIS

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The work introduces a smart energy-related consumption system that aims to detect deviations in the pattern and develop a better comprehension of how to use time-series data. This system takes advantage of a multi- perspective analytical perspective to identify both minimal and remarkable consumption patterns deviations whilst being flexible under different data circumstances. The combination of reconstruction-based learning and statistical analysis successfully separates regular operation patterns and abnormal fluctuations in the framework. Also, forecast technologies are included to determine the

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future consumption trends and enhance accuracy in prediction. The modular design allows effective data processing, application deployment, and easy visualization via interactive interface. Experimental testing shows that there is better consistency and interpretability of detection than as a single model. The proposed solution gives a scalable and real-world energy monitoring application a reliable base to enable proactive decision-making, resource optimization, and enhanced awareness of the working environment in dynamic environments.

242. A TWO-PHASE BEHAVIORAL APPROACH TO AUTOMATED CODE SYNTHESIS FROM INDUSTRIAL META-MODELS

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Although Model-Driven Engineering (MDE) greatly helps to characterize the static architecture of complex, safety-critical environments, the process of converting those designs to a dynamic executable code base generally requires a substantial amount of manual coding (often resulting in many errors) to complete. To help automate this process, this research proposes the creation of an innovative multi-layer framework that will facilitate the transition from structural design to operating semantics by referencing industrial meta-models (e.g., XMI and XSD) and creating a matrix of corresponding behaviour . This methodology combines deterministic behaviour rules with advanced AI based behaviours synthesis to automatically extract and inject execution behaviour from the high level structural models without the need to create the deterministic behaviour rules. Finally, by defining these models as the single source of truth for both the structure as well as behaviour, we are able to reduce inconsistencies in systems, increase reliability, and significantly shorten the overall development and ability to implement/operationalize cycles of large scale industrial software applications.

243. AUTOML: A LIGHTWEIGHT PYTHON LIBRARY FOR AUTOMATED MACHINE LEARNING WITH BUILT-IN TEXT CLASSIFICATION AND SELF-TUNING HYPERPARAMETERS

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In today world, machine learning is an integral part of every field. However, developing a quality model is still a very challenging job for the majority of the population. Currently available AutoML tools have severe restrictions like the environment being only Linux-based, the runtime being only Java-based, the time being only 1 hour, etc. None of the tools currently available are able to work directly with text data. In this paper, we have introduced a new lightweight Python library called AutoML. Using our

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library, anyone can learn how to do machine learning in just three lines of code. It is capable of training models, selecting the best model using cross-validation, and tuning the best model without requiring the user to do anything extra. It is also capable of working directly with text data like star ratings from reviews. We have tested our library using 13 real-world datasets from UCI and Kaggle. In our experiments, AutoML achieves the best results for 12 out of 13 datasets. Its mean accuracy is 93.27%, achieving 7.3% better results than the next best library, i.e., PyCaret. It takes only 5 seconds to install our library. It is designed to work on the Windows environment.

244. AI-BASED SMART BRIDGE SYSTEM FOR ENHANCING LEARNING OPPORTUNITIES IN UNDERSERVED COMMUNITIES

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Access to quality education remains a significant challenge for students in underserved and economically weaker communities due to high costs, limited infrastructure, and poor internet connectivity. This paper presents an AI-Based Smart Bridge System, a web-based platform that connects verified volunteer teachers with underprivileged students. The system incorporates artificial intelligence techniques such as personalized course recommendations, intelligent teacher-student matching, and learning analytics to improve educational outcomes. It also includes features like a virtual abacus and a secure teacher verification process. Designed for low-bandwidth environments and basic smartphones, the platform ensures accessibility and inclusivity. Experimental results demonstrate improved engagement and enhanced learning efficiency.

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245. HUMORA: AN INTELLIGENT CNN-BASED MULTIMODAL REAL-TIME EMOTION RECOGNITION SYSTEM USING VIDEO, AUDIO, AND TEXT

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Understanding human emotion is essential for building responsive and intelligent interactive systems. Using a single modality, such as facial expressions or vocal behaviour, often leads to inconsistent results because of random environmental factors and errors related to noise in the environment. This paper proposes a real- time multimodal emotion recognition system called HUMORA that combines three modalities: facial analysis, speech features, and text-based emotions. A decision level fusion method integrates these three modalities to yield one final output of an emotional classification. Each modality is processed independently, but they are then combined at the end using confidence-based aggregation to produce one output. HUMORA can operate as web-based application in which live data can be accepted. Results from the study indicate that combining modalities improves both stability and reliability of emotion predictions compared with predictions from a single modality, while still meeting practical real time constraints.

246. FEATURE-LEVEL FUSION OF CNN AND HANDCRAFTED FEATURES FOR SKIN CANCER DETECTION THROUGH CLINICAL IMAGE PREPROCESSING

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Skin cancer is one of the most prevalent cancers in the world, and Melanoma is especially dangerous because of its aggressive metastatic behavior, and skin cancer is still one of the cancers that is growing at the fastest rate in the world. Although survival rates are greatly increased by early diagnosis, traditional visual assessment is frequently subjective and dependent on clinical expertise. Automated clinical image-based diagnostic systems offer a useful substitute for dermoscopy-based screening in

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settings with limited resources. The improved multi-stage deep learning framework for automated three-class classification of skin lesions into Melanoma, Nevus, and Other Malignant categories was created in Phase II and is presented in this paper. To improve discriminative performance, the suggested system combines advanced data augmentation, structured preprocessing, transfer learning with a refined ResNet-50 architecture, and a boosted classification strategy. To improve generalization and lessen the effects of class imbalance, Phase II, in contrast to the baseline Phase I model, uses ensemble-based decision refinement, hyperparameter optimization, and selective layer unfreezing. With an overall validation accuracy of 83.10%, experimental evaluation shows enhanced classification stability and balanced class-wise performance. Strong class separability is confirmed by ROC analysis, and the contribution of augmentation, fine-tuning, and boosting modules is validated by ablation studies. For practical skin cancer screening applications, the suggested Phase II framework provides a reliable, accurate, and clinically interpretable solution.

247. A SURVEY ON WANNACRY RANSOMWARE AND AI- BASED DETECTION TECHNIQUES

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The Development of ransomware has significantly reshaped the cybersecurity landscape, with the 2017 outbreak of WannaCry ransomware serving as a vital turning point in revealing the flaws of global digital infrastructure. This paper presents a Detailed literature review of ransomware detection techniques, focusing on the propagation characteristics, global consequences, and mitigation strategies associated with WannaCry. Unlike traditional studies that focus on stress signature-based detection, this review explores the transition toward intelligent, manner, and artificial intelligence-based approaches. The study critically evaluates machine learning, deep learning, and generative AI techniques in identifying evolving ransomware threats, highlighting their strengths and limitations. Furthermore, a comparative analysis of detection methodologies is presented to understand their effectiveness against zero-day attacks. The findings reveal that hybrid detection models integrating Activity analysis with generative learning techniques provide a promising direction for future cybersecurity systems. This work aims to assist researchers and practitioners in designing adaptive and resilient ransomware Security mechanisms.

248. DESIGN AND DEVELOPMENT OF A LOW-POWER EMBEDDED EDGE COMPUTING FRAMEWORK FOR REAL- TIME WILDLIFE MONITORING AND DETERRENCE

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In modern agriculture, protecting crops from animal intrusions is a major challenge. This project presents a real-time wildlife monitoring and deterrence system using the YOLO V8 object detection algorithm. The system employs AI-based image processing with OpenCV for pre processing and integrates automatic notification and control mechanisms for enhanced farm security. A camera continuously captures images, and YOLO V8 detects and classifies animals in real time. Detected images are uploaded to a remote server for analysis and then deleted to save storage. Pre-processing steps like noise reduction, resizing, and normalization improve detection accuracy, while compression and feature extraction ensure real-time performance. When an animal is detected, the system sends an email alert with the timestamp and type of animal, activates a buzzer, and displays details on an LCD screen. LED floodlights turn on in low light to increase visibility and deter nocturnal animals. The YOLO V8 model is continuously refined for accuracy and adaptability, offering a practical, efficient solution for smart farm wildlife monitoring and deterrence.

249. PILOT DECISION INTELLIGENCE FOR AVIAN STRIKE EVENTS: A MACHINE LEARNING AND RAG-BASED FRAMEWORK ON FAA INCIDENT DATA

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Bird strikes are a major concern for aviation safety, and decision support for the pilot during a bird strike situation is mostly manual and relies on the pilot's experience. In this paper, we propose a decision support system called BirdStrike- IDS using machine learning for incident classification and

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Retrieval-Augmented Generation for providing decision support to the pilot during a bird strike situation. The proposed system is implemented using a dataset from the FAA wildlife strike database containing 19,302 instances and 17 features. Among them, 1,973 instances were used for training the model, and 16,516 pilot remark instances were used for semantic retrieval. By analyzing the data using various visualization tools, we observed a high imbalance between the four outcome classes: Precautionary Landing (48.9%), Aborted Take-off (27.6%), Other (17.6%), and Engine Shut Down (5.9%). We have implemented BorderlineSMOTE for handling the class imbalance. We have compared the performance of seven different classification models: Multinomial Naive Bayes (baseline), Random Forest, Extra Trees, CatBoost, XGBoost, Voting Ensembles, and Gradient Boosting. Among them, Gradient Boosting with BorderlineSMOTE outperforms the other models by producing an accuracy of 74.68%, an F1-score of 0.7355, and an MCC score of 0.6093 compared to the baseline Multinomial Naive Bayes model proposed by the base paper (MCC: 0.5181). We have also implemented the RAG component for providing decision support to the pilot during a bird strike situation.

250. A MACHINE LEARNING FRAMEWORK FOR BLOOD GROUP IDENTIFICATION USING FINGERPRINT BIOMETRICS BASED ON CNN AND XGBOOST

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Identification of human blood groups is an important in any kind of medical emergencies to provide proper treatment and diagnosis in that situation they used traditional serological methods. It is accurate but require a lot of time and samples of human blood, which invasive, time-consuming and require skilled medical person and laboratory facilities. In order to overcome these limitations, various alternative statistical methods have been proposed. The method is the correlation between blood groups and fingerprint patterns, such as loops, whorls, arcs, and composite patterns. Various datasets and methodologies have been used for this purpose. The proposed method aims is to improve the accuracy and efficiency of predicting the blood group, as it is highly important in the field of health care. So, a web application has been developed using the Flask framework and an SQLite database, along with user authentication that enables users to upload images to predict the blood group. The proposed model uses a dataset consisting of 8,000 images of fingerprints, classified into eight blood group classes, namely, A+, A-, B+, B-, O+, O-, AB+, and AB-. The features are extracted from the fingerprint images using a Convolutional Neural Network (CNN) algorithm, and classification is done using the XGBoost algorithm. The proposed model has achieved an accuracy of 92%, thus enabling it to become a fast, efficient, and non-invasive method for predicting human blood groups.

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251. MULTIMODAL MACHINE LEARNING AND DEEP LEARNING APPROACH FOR STROKE PREDICTION USING STRUCTURED CLINICAL DATA AND CT–MRI BRAIN IMAGING

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Stroke is still common prime reason of death and disability. Thus, the detection of strokes at the earliest is critical since the delay in the process causes the death of neurons. In the present study, the Multimodal Stroke Detection System has been proposed. In the system, the Convolutional Neural Network (CNN) is used for the automatic detection of strokes from CT scans and MRI scans of the brain. In addition to the CNN, the system has used the Logistic Regression, Random Forest, and SVM machine learning(ML) algorithms for the detection of strokes from the structured data of patients. In the system, the modality of the image is recognized, the image is segmented, and the type of stroke is identified as Hemorrhagic (Bleeding), Ischemic (Blocked Blood Flow), Normal, etc. In addition to the type of stroke, the exact region is identified as well. In the system, the CNN has reported a validation accuracy of 99.26%, while the Logistic Regression and Random Forest have reported 95%. In addition, the SVM has reported 78%. Thus, the system is effective compared to the existing methods. In addition, the system has been implemented as a web application using the Flask framework.

252. CARDIOSENSE PRO: MULTIMODAL ECG CLASSIFICATION VIA 1D- CNN AND CWT SCALOGRAM FUSION WITH CONFIDENCE- AWARE DEPLOYMENT

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Automated identification of clinically significant classes of electrocardiogram (ECG) signals, including Arrhythmia (ARR), Normal Sinus Rhythm (NSR) and Congestive Heart Failure (CHF), is a difficult problem because of imbalances in the classes, inter-patient variability, and complementary time-domain and time- frequency ECG representations. This paper proposes CardioSense Pro, a multimodal ECG classification framework that processes each ECG recording through two parallel branches: (1) a 1D Convolutional Neural Network (CNN) trained directly on raw ECG windows to capture morphological and rhythmic features, and (2) a 2D CNN branch built on a pretrained ResNet18 backbone, trained on Continuous Wavelet Transform (CWT) scalogram images that encode time-frequency structure. The branch logits are concatenated and processed by a lightweight fusion head to produce the final ARR/NSR/CHF prediction. To improve CHF recall, a stratified training split, class-weighted cross-entropy loss, and a weighted batch sampler are incorporated. Post-training temperature scaling, fitted on a held-out validation set, calibrates the predicted probabilities for reliable confidence reporting.

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Multi-window inference and a confidence-aware decision rule further improve deployment robustness. Experiments on PhysioNet ECG databases demonstrate that the proposed CardioSense Pro fusion model achieves 98.33% accuracy and 98.33% macro- F1, outperforming the 1D-only branch (86.67% accuracy, 86.32% macro-F1) by +11.66% in accuracy and the 2D-only branch (61.67% accuracy, 50.24% macro-F1) by +36.66% in accuracy, with a CHF recall of 100%. These results confirm that combining complementary ECG representations through learned fusion offers a scalable and reliable approach to automated ECG screening support.

253. PREDICTION OF OCEAN SALINITY AND OCEAN TEMPERATURE

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Climate science and oceanography are dependent on accurate predictions of ocean temperature and salinity at various depths. The present prediction systems have a significant gap, as they only pay attention to the surface level predictions. When we push these surface-optimized models to make predictions further into the depth horizon of the water column, they tend to break down in performance drastically as the physics that governs the models become radically different the further down you go. Rather than trying to make a single algorithm use for all depth profiles, the paper introduces a hybrid framework that divides predictions by depth. We align the modeling strategy with the realities of the physical world of each layer. The upper layer (0-10 m) is turbulent, and it is caused by the fast atmospheric changes. To model these very sequential time-varying changes, the system uses a Gated Recurrent Unit (GRU) network. At altitudes below 10 meters, that temporal structure mostly disappears. Environmental variables are complex and nonlinear corelating. In this depth profile range, forecasting is replaced by a Light Gradient Boosting Machine (LightGBM). We constructed a combined dataset to nourish both architectures that combines highly localized, in-situ buoy measurements of the National Institute of Ocean Technology with wide ERA5 reanalysis data of Copernicus (ECMWF). The evaluation of the system using MAE, RMSE, and R 2 measures showed a distinct prediction. Whereas the conventional single-model baselines rapidly degrade with depth, our depth-partitioned model ensured absolute predictive consistency. This framework eventually provides a computationally efficient, highly scalable framework to Multi-depth Ocean forecasting.

254. CONTINUOUS INTEGRATION AND DEPLOYMENT SYSTEM FOR MICROSERVICES

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Microservice-based applications have become popular for their scalability and flexibility, but deploying and maintaining them efficiently remains challenging. This paper presents a student-friendly overview of a Continuous Integration and Continuous Delivery (CI/CD) pipeline for microservices, explaining key concepts and processes in a simplified manner. We first discuss the need for systematic microservice deployment and review existing approaches to continuous integration and deployment. We then describe a step-by-step process for designing and automating microservice deployments. Next, we illustrate a simplified CI/CD pipeline implementation using common tools (GitHub, Jenkins, Docker, Kubernetes) and demonstrate how continuous testing and monitoring (with Grafana dashboards) are integrated into the pipeline. The goal is to help students understand how automated pipelines can streamline microservices development, deployment, and monitoring. We maintain an academic structure while ensuring clarity and a cohesive narrative suitable for college-level study.

255. LIFE-SAVING HEALTH CARD: NFC-ENABLED EMERGENCY MEDICAL IDENTIFICATION SYSTEM WITH ANDROID INTEGRATION

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Quick and precise retrieval of patient medical history is essential in life-saving interventions in cases of medical emergencies. But, in many cases, the victims of accidents or just unexpected health conditions cannot tell the critical information, including allergies or blood type. Paper-based records and local Electronic Health Records (EHRs) are often ineffective in the field environments because of their connection problems or lack of connection infrastructure. In this paper, the authors present the solution called Life- Saving Health Card, which uses the Near Field Communication (NFC) technology in combination with a dedicated Android application. A unique identifier is logged to an NFC tag within the system and first responders are able to access detailed medical profiles in real-time in a secure MySQL data store. This will optimize data security and scalability by keeping little data in the card. The results of experiments reveal that the time of patient's identification decreases significantly, which enhances the efficiency of emergency response. Moreover, a poll of healthcare providers revealed that 95% were completely satisfied with the functionality and ease of implementation of the system.

256. A ROBUST SPEECH EMOTION RECOGNITION FRAMEWORK WITH FEATURE-LEVEL MASKING AND ACOUSTIC AUGMENTATION

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Speech Emotion Recognition (SER) systems achieve high accuracy on clean, studio-recorded datasets but show significant performance degradation in real-world conditions such as noise, reverberation, and channel distortions. This limitation affects their practical deployment in applications like mobile systems and human-computer interaction. To address this issue, this work proposes RobustSERNet, a domain-robust SER framework designed to improve generalization under di- verse acoustic degradations. The proposed system integrates an acoustic augmentation pipeline that simulates real-world con- ditions including noise, room reverberation, telephone filtering, and codec degradation, along with a 130-dimensional multi- feature representation capturing diverse speech characteristics. Additionally, a novel FeatureMaskLayer is introduced to en- force feature-level robustness by masking groups of acoustic features during training. The model is trained and evaluated on the RAVDESS dataset using stratified cross-validation with a controlled validation strategy. Experimental results demonstrate strong performance on clean speech and consistent robustness under noisy and degraded conditions. These findings highlight the effectiveness of combining realistic augmentation with feature- level regularization for building reliable SER systems.

257. EARLY PARKINSON'S DISEASE DETECTION USING MULTISCALE ATTENTION-FUSION TEMPORALNET

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Early diagnosis of the Parkinson disease has been a challenge because the symptoms manifest late in life and scientists have had to find other symptoms that manifest earlier such as voice changes-non-invasive symptoms that can be detected prior to the onset of physical disability being felt. Though the conventional approaches embrace both hand-crafted properties and the conventional neural models, they do not capture the intricate pre-frequency patterns, poorly incorporate the inputs, or do not perform well with varying recording conditions. To alleviate these limitations, a framework named MAFT-Net divides speech into different time-scale components, to encode fine acoustic variations with advanced spectral processing. “It assigns dynamic meaning to features not by attempting to correlate features in fixed orderings, but by applying attention processes to known indicators - including MFCCs, jitter, shimmer and spectral centroid - with temporal behavioral patterns learned during training. The consistency is improved with inputs being modified to minimize distortion brought about by hardware, be it audio being transferred using the phone, microphone or even in other conditions. The new method is superior to the previous one, with a 0.86 accuracy and an F1-score of 0.89, which means that the technique is more stable in the detection. It seems natural to implement it in remote health monitoring systems which are designed to diagnose Parkinson earlier with these qualities.

258. NEUTROSOPHIC RISK MODELLING FOR UNCERTAIN SYSTEMS USING INVERSE OPERATOR ANALYSIS

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This paper presents a neutrosophic framework for modeling risk in uncertain systems using inverse operator analysis. The approach is based on neutrosophic multifunctions, where relationships are characterized by truth, indeterminacy, and falsity membership values. Lower and upper inverse operators are employed to represent conservative and optimistic evaluations of system behavior. A

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quantitative measure based on the difference between these inverses is used to capture the level of uncertainty and stability in the assessment process. The proposed model provides a structured way to distinguish between confirmed, possible, and indeterminate conditions. The results demonstrate that the framework offers an effective mathematical tool for analyzing complex systems with incomplete and inconsistent information.

259. ENERGY HARVESTING BASED WIRELESS SENSOR NETWORK PILOT DEPLOYMENTS FOR NUCLEAR FACILITY

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Energy Harvesting (EH) is the most desired solution required for maintenance free sustainable Wireless Sensor Network (WSN) monitoring in plant environment. It eliminates the need of frequent battery replacement or need of laying power cables. However, the harvested energy is highly in-deterministic and storage devices (battery or super capacitor) non idealistic nature makes uninterrupted long-term WSN monitoring challenging. In this work we have done multiple Hybrid Energy Harvesting (HEH) based WSN deployments in different environments such as –lab, cluster facility and plant facility. Focus of our work was to experimentally determine the Minimum Sustainable Sleep Cycle (MSSC) for HEH WSN node in different deployment scenarios. MSSC is the shortest sleep duration that ensures sustainable operation over extended periods. This parameter ensures storage device discharge rate is slower than charging rate. Above all, this parameter encompasses the in-deterministic nature of EH sources.

260. SIPTRACK: SIPCOT INDUSTRIAL PERFORMANCE TRACKING SYSTEM

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SIPCOT is responsible for running industrial parks that aid in the economic development of the area by providing shared facilities and resources. However, the current method of collecting data is manual and distributed, with an excessive use of Excel spreadsheets and emails, resulting in inefficiencies and data

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duplication. In order to overcome the issues associated with such an approach, the proposal for "SIPTRACK: SIPCOT Industrial Performance Tracking System" is presented, which is developed using a well-defined role-based workflow with industry admin, SIPCOT admin, and super admin roles, and ensures data authenticity prior to access. The proposed system should automate the reporting process without involving any manual handling of information, which would lead to higher efficiency and availability. In addition to this, it adopts both analytical and machine learning models such as ARIMA, linear regression for predicting turnover, a weighted scoring model for ranking industries, and a decision tree model for industry's performance classification. Additionally, the system provides real-time communication, interactive dashboards, and activity logging for enhanced monitoring and transparency. Overall, SIPTRACK enhances data- driven decision-making and supports effective industrial governance.

261. HUMAN STRESS PREDICTION BASED ON SLEEPING HABITS

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The following paper introduces a machine learning-based approach for the assessment of stress in humans through sleep patterns and physiological metrics. In this study, we examine the multidimensional sleep dataset, including such attributes as sleep duration, quality, latency, heart rate variability, physical activity, and respiratory rate. The efficiency of various classifiers like random forest, XGBoost, support vector machine, and gradient boosting has been analyzed. The result obtained from an extensive feature selection process, followed by correlation analysis and optimization of hyperparameters, shows that both XGBoost and Random Forest classifier algorithms outperform others. The XGBoost classifier yields outstanding accuracy due to its ability to capture complex relationships between fragmented sleep and higher stress biomarker values. On the other hand, the Random Forest model offers valuable insight regarding feature importance and is highly adaptable when dealing with heterogeneous data. The proposed algorithms show high precision, recall, and F1-scores of more than 89%. Moreover, the results of the comparison show slight superiority in sensitivity and specificity of the XGBoost algorithm compared to the Random Forest method. The important features that affect predictions include sleep quality, heart rate variability, and sleep duration.

262. HYBRID BIOMEDICAL NAMED ENTITY RECOGNITION USING PUBMEDBERT, TRANSFORMER-CRF AND CONSISTENCY RULE REPAIR

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The process of identifying certain entities, such as proteins, genes, chemicals, and diseases, in texts within the biomedical domain is referred to as Biomedical Named Entity Recognition (BioNER), and it is a major component of Natural Language Processing (NLP). The reason why BioNER is important is due to the complexity of terminology and inconsistencies in their naming conventions throughout the

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body of literature that makes them very difficult to identify. In this work, the authors describe the development of a hybrid BioNER model that uses PubMedBERT together with an encoder combiner based on the Transformer model with CRF decoding. The use of PubMedBERT allows for the identification of linguistic features in text from the biomedical domain. The use of the encoder based on the Transformer (which is an architecture for encoding text) provides contextual understanding between tokens in the text. The use of CRF will help ensure the predicted labels are structured correctly (the prediction of a label sequence). In addition, we present a module for fixing sequences of invalid tagging by implementing a "BIO consistency rule repair" module. Finally, we provide results of experiments using datasets associated with the JNLPBA, BC5CDR, BC2GM, and NCBI Disease tasks and show that the proposed hybrid model produced a final F1 Score of 89.76% and outperformed several other BioNER Approaches.

263. A LEARNING & REGULARIZING CODE SMELL PREDICTION USING HYBRID CONTRASTIVE-TRANSFORMER FUSION

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Code smells arise when software engineering principles are ignored during software development lifecycle. They reduce maintainability and degrade overall software quality significantly. Code smell detection evaluates maintainability and improve software quality. Despite many studies, understanding real developer patterns remains unclear. Existing methods cover only limited smell types and variations. They struggle with Feature Envy and God Class detection. They also fail to capture complex structural and contextual patterns. As a result, current models show weak generalization performance. To address these issues, we propose an embedding-based detection approach. Our approach combines GraphCodeBERT, Triplet Loss, and Hybrid fusion learning. It captures semantic relationships and

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contextual information in source code. We construct a large dataset using SonarQube for evaluation. The dataset contains 53727 smell samples and 97169 clean samples. We compare models using accuracy, precision, recall, and F1-score. GraphCodeBERT achieves strong performance with high overall accuracy. It reaches 90.54% accuracy with balanced precision and recall. The Triplet model improves embedding quality but lowers classification accuracy slightly. It achieves 81.84% accuracy with moderate precision and recall. Our hybrid model combines both strengths for better generalization performance. It achieves the best accuracy of 92% across datasets. The results confirm improved detection and robust performance across complex code patterns.

264. AI BASED BURN INJURY ANALYSIS AND SKIN GRAFT PLANNING SYSTEM

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The evaluation of burn injuries continues to give a significant challenge within the field of emergency medicine, as conventional diagnostic techniques are there as an inter-observer variability of 30-40%. This research introduces an AI-based system for classifying burn severity, using ResNet-50 architecture to provide automated analysis and treatment planning. The system was trained using 1,221 images of burn injuries categorized into three severity levels (first, second, and third- degree burns) and attained an overall accuracy of 94.5%, with a precision rate of 93.2% specifically for third-degree burns. Furthermore, the model showed a 92% agreement with expert clinical evaluations regarding the prediction of skin graft requirements and delivered real-time analysis at a rate of 2.3 seconds per image. The web-based interface allows for accessible assessment of burn care in settings with limited resources. This proposed method contributes to the advancement of automated burn diagnosis by merging severity classification with clinical decision support for planning skin grafts.

265. PHARMASSIST AI: A MULTILINGUAL DOMAIN-SPECIFIC PHARMACY ASSISTANT USING RETRIEVAL-AUGMENTED GENERATION

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Hallucinations in General-Purpose Large Language Models (LLMs) pose a patient safety concern for the application of such models for pharmaceutical information retrieval tasks. The model “knowingly” hallucinates information about dosage, contraindications, or drug interactions, which leads to ADEs, resulting in 1.3 million emergency department visits each year in the United States alone. This article discusses our novel solution, PharmAssist AI v2.0, which uses RAG for domain-specific pharmacy assistance with zero hallucinations. Unlike General-Purpose LLMs, our solution ensures that all information exchanged is grounded in our domain-specific knowledge base, eliminating hallucinations altogether. PharmAssist AI v2.0 is an extension of our existing RAG-based v1.0 model, incorporating nine major features: (1) multi-user authentication for multiple users with auto-seeded default user account creation and user-specific persistent chat history, (2) native multilingual support for Tamil,

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Hindi, and English using prompt-level language injection without the need for model retraining, (3) completely deterministic Drug Interaction Checker using our existing knowledge base populated with ten clinically validated drug pairs categorized according to severity levels, (4) Real Drug API module using official sources such as OpenFDA, FDA FAERS, FDA Enforcement, and RxNorm NIH for official drug labels, real-world adverse event counts, live recalls, and classifications, (5) automatic injection of live API results into our existing knowledge base, ChromaDB, for enhanced model retrieval capabilities for all subsequent chat queries, (6) completely deterministic Dosage Checker using our existing knowledge base populated with ten clinically validated drug pairs, (7) automatic injection of live API results into our existing knowledge base, ChromaDB, for enhanced model retrieval capabilities for all subsequent chat queries, (8) completely deterministic Contraindications Checker using our existing knowledge base populated with ten clinically validated drug pairs, and (9) automatic injection of live API results into our existing knowledge base, ChromaDB, for enhanced model retrieval capabilities for all subsequent chat queries. (6) A per user analytics engine for query count, latency, language, and drug frequency; (7) A Role-Based Admin Dashboard, implemented as a fifth tab in the Streamlit application, restricted to user roles; (8) A four-metric evaluation dashboard inspired by the RAGAS evaluation framework, using interactive Altair visualizations; and (9) The ability to export entire consultation sessions to PDF, including proper attribution. Evaluation using the RAGAS evaluation framework on five pharmacology questions shows high fidelity in the generated response, with Faithfulness 0.87, Context Relevance 0.82, Answer Relevance 0.85, and Ground Truth Match 0.78. The entire application incurs zero infrastructure costs, using free-tier LLM APIs and local embeddings, making it immediately deployable in academic and resource-constrained healthcare settings.

266. DIGITALISATION OF MANUAL PROCTOR DIARY SYSTEM

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The Manual Proctor Diary system is intended to be implemented on a computer. It replaces the current paper proctoring records with a digital platform that is both secure and efficient. It's difficult to manage of paper proctor diaries. Issues include misplacing the paper, breaking it, errors mistakes when recording data, and not being able to get records when you require them. These issues may cause to lose of significant student information and failing to monitor academic progress. The digital proctor diary provides a precise, structured way to gather, manage, and access student data. It decreases the chance of human errors in manual recording, enhance accuracy, and maintains data consistent. The institution will advantage from characteristics like transparency, data reliability, and secure preservation of academic records. Additionally, academic and administrative staff can easily utilize its user-friendly interface. In summary, the digital proctor diary system provides a cutting-edge way to efficiently and securely manage proctoring in a classroom setting. When needed, the technology makes it possible to rapidly get student data. It supports effective student performance tracking and proctor-student interaction.

267. AN EXPLAINABLE DUAL-MODAL MACHINE LEARNING FRAMEWORK FOR AUTISM SPECTRUM DISORDER SCREENING USING BEHAVIORAL AND FACIAL IMAGE FEATURES

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Autism Spectrum Disorder (ASD) screening can also be based on the behavioral assessment formulations that require the professional review to identify the results. The method of machine learning has been integrated to conduct screening through a range of models. The methods are however not primarily aimed at classification accuracy but interpretation and practical application conditions.

This study is a dual-modal framework of ASD that considers both responses on behavioral questions and facial image characteristics to detect ASD. In the case of the behavioral data, multiple age group AQ-10 datasets are subjected to a series of selected preprocessing steps, which comprise of KNN imputation dealing with the missing features and the SMOTE-Tomek method of avoiding class imbalance. Ensemble algorithms such as XGBoost and LGBM are used to ensure stability.In the meanwhile, the images of faces are normalized and converted into a comparable numerical form using Histogram of Oriented Gradients (HOG) descriptors. Subsequently, the images are fed to the classifiers as a learning set to discover discriminating patterns.The SHAP is then integrated into both pipelines for feature-level interpretation of model decisions, increasing the transparency. The behavioral pipeline achieved 99% accuracy while the facial pipeline achieved 77% accuracy. The complete framework is implemented as a web application using Flask that enables real-time prediction together with explanation visualization. It was intended to support, not replace, clinically interpretable and practical ASD screening.

268. DEEP FEATURE BASED ORAL CANCER CLASSIFICATION USING CNN-LSTM

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Early and proper diagnosis of oral cancer is one of the keys to improved survival of the patients and proper treatment. The traditional methods of diagnosis are manual inspection and clinical judgment that are time consuming and subjective. To address these challenges, a deeper feature-based oral cancer classification framework that integrates convolutional and sequential learning with a better explainability is introduced in this paper. Suggested system ResNet53 convolutional neural network is a strong feature extractor that will be pretrained to extract rich spatial features of images of the oral cavity. The features are then fed in to a Bi-LSTM network which could be utilized to yield robust classification as either cancerous or non-cancerous. It is based on an elaborate preprocessing pipeline, including removal of corrupted images, grayscale/RGBA image standardization to RGB and standard resizing. The augmented image datastores are used in increasing the ability of generalization. To be valid and resilient, the model is cross-validated with the five-fold cross- validation assistance. The measurement of performance is through a few measures of evaluation including accuracy, sensitivity, specificity, precision, F1- score, Dice coefficient, Jaccard index and Matthews Correlation Coefficient (MCC). Also, Receiver Operating Characteristic (ROC) and Precision-Recall (PR) curve analysis is also performed to measure the classification performance in relation to various thresholds. Grad-CAM and Score-CAM visual explanation methods are also featured to enhance interpretability, and patterns of discriminative regions that impact model predictions. Further, a novel quantitative explainability measure is introduced which is referred to as Lesion Concentration Score (LCS) to determine the concentration and consistency of the activation maps. Entropy analysis is also done to measure allocation of attention of the regions. Comparative visualization statistics distribution analysis on radar plot and statistical analysis of behavior of the model provides more information on the behavior of the

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model and explainability performance. The proposed framework is highly classified and more interpretable and can be efficiently implemented in the real world clinical decision support systems.

269. GRAPH-GROUNDED MULTI-AGENT LLM SYSTEM FOR SUSTAINABLE CROP RESIDUE UTILIZATION PLANNING

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Mismanagement of agricultural residues is a critical issue in India, where tons of biomass simply get wasted or burnt. They damage the environment and also result in economic loss. This research proposes the AI-enabled decision support system that combines Large Language Models (LLMs) with a Neo4j knowledge graph for determining sustainable, site-specific residue-use plans. The system uses a dual-agent architecture: the Planner Agent generates KG-grounded allo- cations across composting, biochar, biogas, and livestock feed, and the Optimizer Agent assesses these against constraints such as CO2 emissions, capacities for processing, soil requirements, subsidies, and burning regulations. Outputs of the framework include tonnage estimates, sustainability scores, and visual decision analytics while significantly limiting LLM hallucinations through graph ground- ing and constraint verification. The approach enhances a decision reliability base on climate-resilient agriculture biomass waste management.

270. RANSOMWARE DETECTOR USING DEEP LEARNING

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The project Ransomware Detector Using Deep Learning develops a system which uses its adaptive DL models and real-time multi-layered monitoring systems to identify ransomware attacks. The system uses machine learning algorithms which operate through MLP and LSTM and Light GBM and Random Forest and XGBoost to detect ransomware threats by analyzing critical aspects of network traffic which

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include packet size and header length and inter-arrival time IAT and data flow magnitude. The system applies pre-trained models to classify network activity through input features which show whether the activity is normal or harmful. The system uses its multi-layered monitoring system to collect data from all system parts which include network traffic and system behaviour to detect ransomware attacks. The system uses this proactive approach to detect threats early which reduces potential damage. The application provides a user authentication system which enables administrators to access their predictions while providing model selection options that support their adaptive learning process to achieve ongoing development.

271. ML AND DL BASED COMPREHENSIVE REVIEW ON CROP RECOMMENDATION SYSTEM AND DECISION SUPPORT SYSTEM

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Crop recommendation systems (CRS) are now an important part of precision farming. It means using data to make decisions that will make crops more suitable, productive and efficient in their use of agricultural resources as the climate and economy become less stable. Recent Advancements in machine learning (ML), deep learning (DL) and artificial intelligence systems have significantly enhanced CRS's predictive capabilities. Still, widespread use is limited because of many problems with model interpretability, data heterogeneity, deployment feasibility and so on. This review provides a summary of current CRS research. It elaborates in comparison of ML and DL models, using hybrid and explainable AI architectures, considering personalization and socio-economic factors, and using cloud and IoT infrastructures to deploy CRS. It also illustrates of integrating data from different sources like soil, climate, RS and IoT. To build trust and help people make smart choices, Explainable Artificial Intelligence (XAI) is now a must. This review highlights a significant shift from standalone predictive models to unified decision support systems that incorporate personalization, participatory design and socio- economic constraints. From a deployment perspective, distributed architectures employing advanced computing demonstrate the potential for real-time, resource-efficient operation, particularly in constrained environments; however, challenges concerning interoperability, scalability and governance remain.

272. CLEARALLER VISION: PERSONALIZED ALLERGEN TRANSPARENCY SYSTEM

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The scientific names and nonstandard product appearance make it difficult to find hidden allergens in packaged products. The existing methods use exact string matching which cannot identify different word forms and does not allow multiple users to assess their profiles at the same time. The study introduces ClearAller Vision which functions as a dual system that combines Optical Character Recognition (OCR) with the new Hybrid Statistical-Allergen Similarity Scoring (HSASS) algorithm. HSASS uses knowledge-based matching together with TF-IDF weighted statistical similarity and Random Forest classification to create dynamic risk assessment which enables risk measurement. The system processed 2400 augmented product images which were divided into 12 categories and achieved 94.7% accuracy in ingredient extraction and 90.4% F1-score for allergen detection. The system allows users to evaluate multiple profiles at once through its concurrent architecture which protects users from accidental allergen exposure better than manual methods.

273. A PREDICTIVE FRAMEWORK FOR BRAIN STROKE RISK ASSESSMENT USING MACHINE LEARNING AND DEEP NEURAL NETWORKS

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Worldwide, stroke is a cause of both fatalities and chronic brain disorders. People who are at high risk of stroke must be identified so that we can treat them before it occurs. Machine learning has shown great promise in the analysis of clinical medical datasets and in helping physicians make predictions. Nevertheless, numerous stroke risk estimation proposed frame- works are poor at comparing models and do not assist medical professionals in making judgments. computational learning mod- els are the subject of this study. Which machine learning proposed framework uses medical data to estimate the

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likelihood of stroke the best? In order to determine the machine learning algorithm, we developed a proposed framework that examines clinical medical datasets, extracts characteristics from it, trains machine learning models on it, and evaluates the models' performance. To determine which machine learning algorithm works best, we tested a a range of methods, including Extreme Gradient Boosting, Random Forest, and Logistic Regression. To evaluate these machine learning techniques, we used a dataset with 5,110 records. We tested them and utilized a variety of metrics, such as precision and accuracy, to gauge their effectiveness. The findings demonstrate that certain algorithms are superior to others because they are able to identify links in the data that are not immediately apparent. It was the Extreme Gradient Boosting model. Additionally, we examined which aspects of the data are most crucial for stroke risk estimation. Next, we used Django to create a web application that allows physicians to use the model to forecast stroke risk in real time. Our technology demonstrates how machine learning can effectively assist physicians in identify- ing stroke patients and assisting them in making more informed decisions. Stroke is a concern, and we need to figure out how to aid individuals and anticipate it. stroke risk estimation and machine learning are crucial. Our proposed framework can aid in the prediction of strokes. Assist physicians.

274. A MACHINE LEARNING-BASED APPROACH FOR EFFICIENT SPAM EMAIL CLASSIFICATION

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Spam emails: Unsolicited and unwanted messages. Impact: Time wastage, security threats (phishing), and resource consumption Need: Automated spam detection systems to filter malicious content and improve user experience. The objective is to analyze the performance of the XGBoost algorithm and demonstrate its effectiveness in terms of high accuracy, faster training, and reduced overfitting, especially for handling high-dimensional datasets.

275. THE NEURAL HALLOWS: TRIADIC FRAMEWORK FOR BIO- AI INTERFACES USING BRAIN ORGANOIDS, MACHINE LEARNING AND NEUROELECTRONIC SYSTEMS

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The modeling of complex neurological conditions such as epilepsy has been difficult due to research methods that are expensive, time-consuming, and fail to consider the true neural complexity. In this study paper, we suggest a model which is an AI-based prediction of the neuronal behavior in the 3D brain organoids thereby narrowing the gap between computing and biological data. In predicting brain spike sequences, we have trained and tested various state-of-the-art time series models, such as LSTM, GRU, TCN, and the hybrid of the two, on electro- neural data acquired by neuroelectronic devices. To improve model reliability, we balanced the dataset using SMOTE. The best predictor model and the highest accuracy rate were obtained using a combination of TCN and GRU among all models. This approach will provide an efficient way of developing drugs, diagnostics, and increasing knowledge about neurobiology, which aligns with global goals for health and well-being.

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276. CREDIT RISK ASSESMENT USING MACHINE LEARNING

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Economic stability and lending decisions are directly impacted by credit risk assessment, which is a persistent problem in the financial sector. Traditional methods of creditworthiness assessment are generally rigid rule-based systems and human judgment, which are unscalable as data complexity grows and inefficient. To this end, we developed a credit risk prediction system with machine learning, which relies on data-driven models to predict the probability of default from financial and historical input data. Employing a supervised classification algorithm trained on real financial records, the system effectively categorizes loan applicants into one of three risk groups: Low, Medium, or High. A Python-based backend powers the system's prediction engine, which is coupled with a user-friendly interface allowing users to upload data, run risk assessments, and download detailed reports. The application includes built-in data validation and secure role-based access for different types of users including loan officers, analysts, and students. Designed for academic and institutional use, the system demonstrates reliable accuracy and responsiveness, paving the way for smarter decision-making in credit evaluation.

277. RETAILYNX: AN AI-POWERED VOICE BILLING AND BUSINESS AUTOMATION PLATFORM FOR SMALL AND MEDIUM RETAIL ENTERPRISES

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This paper presents Retailynx, a full-stack, AI-powered web application that replaces manual bookkeeping with natural voice interaction in regional Indian languages. The system integrates a Web

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Speech API-based speech-to-text pipeline, a multilingual intent classification model, and six core modules: Product Management, Billing Engine, Inventory Control, Udhar (Credit) Tracker, Report Generation, and Voice AI Assistance. Retailynx generates bills, updates stock, records credit, and dispatches payment reminders entirely through spoken commands. An embedded analytics engine mines transaction history to surface revenue summaries, sales velocity trends, and credit risk indicators. Evaluation across 38 shopkeepers in Maharashtra over eight weeks demonstrated a 58% reduction in transaction recording time, a 72% decrease in bookkeeping errors, and a 91% sustained daily usage rate — markedly outperforming comparable text-entry ledger applications. These results confirm that voice-first, AI-augmented interaction design is both technically viable and commercially significant for the underserved microretail segment in India.

278. SEMANTIC RESUME-JOB MATCHING USING TRANSFORMER EMBEDDINGS AND LARGE LANGUAGE MODELS FOR IMPROVED RELEVANCE AND DECISION SUPPORT

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Traditional Applicant Tracking Systems (ATS) depend on word-level filtering that often misses the actual intent behind a candidate's profile. This limitation can lead to the exclusion of qualified candidates due to variations in terminology and resume structure. To address this challenge, this paper presents a multi-stage semantic resume-job matching system that integrates structured resume parsing, transformer-based embeddings, and large language model based enhancement. The proposed approach uses a Sentence Transformer model to convert text into dense vector representations, allowing meaning-based comparison between resumes and job descriptions. Unlike traditional methods, this work focuses on how score distribution behaves in practice, since a usable score range matters more than just ranking order. A large language model is further incorporated to generate readable summaries covering what the candidate brings, what is missing, and why the match scored the way it did. Experimental evaluation demonstrates a clear jump in similarity scores over the TF-IDF baseline — roughly 11x higher on average — along with a more meaningful distribution that supports threshold-based filtering. While ranking-based metrics show limited variation, the results highlight the effectiveness of semantic embeddings in capturing contextual relationships. The proposed system offers a practical and scalable solution for modern recruitment by combining semantic understanding with interpretable decision support.

279. TRAFFIC CONGESTION PREDICTION BASED ON TEMPORAL FEATURE WEIGHTING

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The deployment of intelligent traffic control technology is necessary due to the severe congestion caused by the growth in urban vehicle traffic. Large-scale traffic databases and sophisticated machine learning and deep learning algorithms are now on the market, making it possible to predict congestion patterns with accuracy. In this work, a Long Short- Term Memory (LSTM) model with temporal feature weights is used to suggest a traffic congestion prediction system. The model considers temporal and environmental elements, including time of day, day of week, weather, and location specific traffic jam patterns, in order to estimate congestion levels. Unlike traditional methods that rely on static models, the take method uses LSTM networks to capture chronological dependencies in traffic data. The dataset is based on actual traffic conditions in Chennai, such as location- based density, weather variations, and peak hours. The model is trained as a classification problem in order to categorize congestion into Low, Medium, and High levels. this model obtained balanced precision, recall (~70%), and F1-score in addition to an overall accuracy of about 71%.

280. REAL-TIME DEEP LEARNING VOICE CONVERSION FOR WEB-BASED KARAOKE APPLICATIONS

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This article presents a server-side deep learning pipeline for real-time singing voice conversion (SVC) in web-accessible karaoke applications. The inference costs of high-fidelity retrieval-based voice conversion (RVC) cannot be supported by consumer hardware, and the installation requirements of current desktop systems are prohibitive, making implementation on mobile platforms or browsers

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infeasible. Our architecture offloads all neural inference to a remote NVIDIA T4 GPU, served through a zero-installation browser client. The five-stage pipeline includes spectral noise suppression by spectral subtraction, vocal source separation utilizing Demucs, mel- spectrogram extraction (44.1 kHz, 256 samples/hop), and voice conversion with U-Net using Adaptive Instance Normalisation (AdaIN) speaker conditioning. A perceptual evaluation of 52 naïve listeners was conducted with 20 target voices and 6 protocols (ITU-T P.800-aligned ACR protocol), yielding a Mean Opinion Score (MOS) of 4.1 ± 0.12 and a cosine- based speaker similarity of 0.87. A systematic ablation experiment reveals that vocal source separation is the most important contributor to quality (+0.8 MOS, +0.15 speaker similarity); HiFi-GAN synthesis contributes +0.6 MOS. Statistically significant pairwise differences are found across all ablation conditions (one-way ANOVA, F(2, 747) = 84.3, p < 0.001; Tukey post-hoc). Cross-device latency measurements confirm that client hardware has no significant effect (p = 0.09, Welch t-test), confirming server processing as the performance bottleneck.

281. PREDICTING SEPSIS ONSET HOURS IN ADVANCE USING DEEP LEARNING AND SURVIVAL ANALYSIS

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This work presents an effective deep learning–based framework for the early prediction of sepsis onset using ICU patient time-series data. The proposed approach utilizes clin- ical data from the PhysioNet Sepsis Challenge 2019 dataset and focuses on preprocessing, temporal feature modeling, and early-warning risk estimation [7], [8]. Multivariate hourly phys- iological and laboratory measurements are processed to capture complex temporal patterns associated with sepsis development. A time-series deep learning model is employed to learn patient health dynamics over time, while survival analysis techniques are integrated to estimate both the risk of sepsis and time-to-onset [5], [6]. The system generates predictive outputs at 3-hour, 6-hour, and 12-hour horizons, enabling proactive clinical intervention before sepsis onset. Model performance is evaluated using stan- dard medical prediction metrics including AUROC, AUPRC, and concordance index (C-index) [9], [10]. The experimental results demonstrate that combining deep learning with survival analysis provides a reliable and clinically meaningful solution for early sepsis risk assessment, highlighting the potential of artificial intelligence in critical care decision support and patient outcome improvement.

282. CODE-AWARE PROMPTING PIPELINE (CAPP): A CONTROLLED AND INTEGRITY-PRESERVING LLM FRAMEWORK FOR COMPETITIVE PROGRAMMING

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The inclusion of Large Language Models (LLMs) in competitive programming environments creates a major impact on how engineers prepare for technical interviews. The platform LeetCode enables users to solve algorithmic problems through structured methods, but the LLM generated solutions often results in uncontrolled code synthesis, context unawareness, and decreased analytical thinking. A generic LLM assistant follows traditional coding methods which do not incorporate user-created code, resulting in ineffective token processing and reduced understanding of the program's structural components. This research presents a Chrome extension which provides users with code-aware structured algorithmic support through its integration of the Gemini model without implementing code generation. The proposed system dynamically captures user-authored code from the LeetCode editor and feeds it into a Code-Aware Prompting Pipeline (CAPP). The CAPP system uses problem metadata and execution feedback and code structure analysis to create three specialized modules that respond to user needs. The system provides three functions which include 'Get Help' to offer progressive conceptual hints, 'Debug My Code' to find logical and edge-case code bugs, and 'Optimize My Code' to assess time complexity while making suggestions without code generation. The proposed system uses strictly technical performance metrics for evaluation which include debugging accuracy, Refine@k iterative convergence, accuracy in time complexity classification, optimization validity rate, solution leakage rate, and token reduction percentage compared to unrestricted LLMs. The experimental results demonstrate that the proposed framework enables users to think within specific contexts while maintaining control over code creation and achieving efficient token usage, which leads to high debugging accuracy and optimization validity. The proposed framework functions as a scalable LLM system because it maintains data integrity during all forms of user interaction.

283. AI-BASED OFFLINE CROP DISEASE DETECTION AND VARIETY IDENTIFICATION SYSTEM USING MOBILENETV2 WITH SEVERITY ANALYSIS AND ENVIRONMENTAL AWARENESS

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Agriculture underpins food security and the livelihoods of millions of smallholder farming families across India. Despite its central importance, crop health management remains a persistent challenge, especially in remote regions where trained agronomists and reliable internet connectivity are both scarce. This paper presents a fully offline, mobile-based artificial intelligence system for detecting diseases in tomato and potato crops, built on an enhanced MobileNetV2 architecture. Farmers capture or upload a leaf photograph through a smartphone application; the on- device model then identifies the crop category, discriminates between local (naatu) and hybrid cultivar types from visual morphology, and classifies the disease across thirteen target classes. An integrated attention mechanism steers convolutional features toward infection-bearing leaf zones, while an image segmentation layer delineates affected tissue and quantifies disease severity into three ordinal tiers: low, medium, and high. Ambient temperature, relative humidity, and geographic region are fused with the visual prediction to generate location-relevant treatment advice. Multi-language output with audio narration enables access for farmers irrespective of literacy level or regional language. Evaluation on a diverse Kaggle- sourced leaf dataset demonstrates 94.2% overall accuracy and 93.9% weighted F1-score, with on-device inference completing in under 1.5 seconds on a mid- range Android handset.

284. REAL-TIME BATTERY MONITORING AND PROTECTION SYSTEM WITH IOT INTEGRATION

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This paper presents the design and implementation of a Battery Management System (BMS) using an Arduino Uno to monitor and protect a two-cell battery pack. The system measures critical battery parameters such as voltage, load current, and temperature using an INA219 current and voltage sensor and a DHT11 temperature sensor. The measured values are continu- ously displayed on an LCD for local monitoring. A NodeMCU Wi-Fi module is integrated to enable wireless data transmission, allowing real-time monitoring of battery parameters on the ThingSpeak mobile application. To ensure battery safety and extend battery life, predefined threshold limits are set for voltage, current, and temperature. When any parameter exceeds its safe limit, the Arduino triggers a buzzer to provide an immediate alert and simultaneously turns off the DC motor through a motor driver to prevent battery damage. The abnormal condition data is also uploaded to the ThingSpeak platform for remote observation and analysis. This paper demonstrates an effective, low-cost, and IoT-enabled battery protection and monitoring system suitable for small-scale energy storage and motor-driven applications.

285. SMART TOURIST SAFETY AND AI-BASED INCIDENT RESPONSE SYSTEM

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With the rapid growth of tourism in the world, the safety of tourists is a major problem in unfamiliar places. During their course of travel, tourists may come across various problems such as lack of information, delayed response in emergency situations, and being in unsafe zones. In order to mitigate the problems associated with tourist safety, this paper proposes a "Smart Tourist Safety Monitoring and AI- Based Incident Response System," which can assist tourists in their safety. In this system, GPS location tracking and Internet of Things devices are combined with Artificial Intelligence. It is helpful in identifying potential risks by knowing the pattern of movement and various conditions. In addition, it is helpful in giving an alert if the risks are identified. The usage of various features like geo-fencing is helpful in identifying the risky areas, while the usage of the emergency SOS feature is helpful in sending information in case of emergencies. In this method, emphasis is given in identifying the risks in early stages, while in the conventional method, response is given only after the occurrence of risks.

286. ACOUSTIGUARD: ADAPTIVE 1/F PINK NOISE MASKING FOR DEFENDING ACOUSTIC SIDE-CHANNEL ATTACKS A HIGH-FIDELITY EVALUATION PIPELINE AND SPATIAL ACOUSTIC ANALYSIS

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Acoustic side-channel attacks pose a severe privacy threat, as ubiquitous microphones can be exploited by machine learning models to infer keystrokes. We present AcoustiGuard, a high-fidelity evaluation framework and defense mechanism that neutralizes acoustic keystroke inference using adaptive 1/f Pink Noise. Unlike prior evaluations that rely on lossy 8- bit image quantization, our pipeline preserves absolute phys- ical acoustic relationships by processing spectrograms as raw Float32 matrices. We evaluate our defense against a state-of-the- art EfficientNet-V2-S attacker model across noisy (Classroom) and silent (Home) environments. Our results demonstrate that adaptive masking scaled to 2.5× the ambient RMS completely collapses attacker efficacy, reducing Macro F1 scores from 95.49% to 1.38%. Furthermore, we introduce a Spatial Acoustic Tier analysis, empirically validating acoustic propagation loss across the keyboard chassis. We publish our deterministic, end- to-end evaluation pipeline to facilitate reproducible research in acoustic side-channel defenses.

287. VULNERABILITY ASSESSMENT AND ATTACK SIMULATION IN SMART CITY INFRASTRUCTURE

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Smart cities integrate Internet of Things (IoT) devices, industrial control systems, cloud platforms, and data-driven services to enhance urban efficiency and sustainability. However, this deep technological integration also introduces complex cybersecurity risks. Existing research highlights vulnerabilities in IoT deployments, SCADA systems, and public digital services, emphasizing the need for structured security frameworks. This paper presents a simulation-based vulnerability assessment of smart city infrastructure conducted within a controlled virtual laboratory. The study analyzes interconnected risks across traffic systems, IoT networks, industrial controllers, and public portals. Using established threat modeling approaches, the research evaluates how minor configuration weaknesses can escalate into large-scale service disruptions. The findings reinforce the importance of multi-layered defense strategies, secure architecture design, governance coordination, and human-centered cybersecurity planning. The study contributes practical and theoretical insight into strengthening resilience in next-generation smart cities.

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288. AUTOMATIC SEGMENTATION OF ABDOMINAL AORTA FROM COMPUTED TOMOGRAPHY USING HYBRID ATTENTION-U NET AND SWIN TRANSFORMER MODEL

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Accurate localization of the abdominal aorta on CT scans plays a crucial role in determining patient risk levels, tracking the disease process, and analyzing structural properties. Although there have been developments in deep learning, it still poses challenges due to class imbalance, blurring of edges, and anatomical variations across different slices. Problems like these often lead to missed small areas and inconsistent results. Though models have improved, performance wobbles where details fade or anatomy shifts unexpectedly. To achieve consistent results in segmenting the abdominal aorta, this work introduces a deep learning strategy blending transformer-driven feature analysis with convolutional decoding steered by attention mechanisms. Instead of relying solely on traditional structures, the design uses a Swin Transformer encoder to grasp broad anatomical context across regions. Spatial precision and edge clarity benefit from a modified decoder built on residual connections and attention controls. Because it merges distant pattern recognition with detailed structure handling, the model manages complex variations within one cohesive training setup. The integration of a global view with detailed information facilitates the delineation process without requiring any post- processing techniques. The use of multiple loss functions ensures both consistency within the region and accurate labeling while solving problems as- sociated with rare instances. Afterward, optimization using shape conditions improves the quality of the structure by eliminating any impossible cases. The proposed system delivers precise and organized seg- mentation results despite an extreme imbalance among classes. Depending on the threshold used, the results will either focus on broader classification cases or minimize the number of false detections. The ability of the model to change is not due to any modifications in its architecture but by adjusting parameters. Changes in the parameters suit various medical needs without requiring any additional learning. In another viewpoint, the outcome generated by the model is consistent when segmenting the abdominal aorta, thus enabling automated vessel segmentation as the first step before conducting further clinical investigations.

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289. INTELLIGENT EMAIL SPAM FILTERING USING BERT FOR ADVANCED SPAM DETECTION

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The increasing prevalence of unsolicited and malicious emails necessitates more robust and context-aware spam filtering mechanisms. Traditional approaches based on feature engineering and classical machine learning models, such as Naive Bayes and Support Vector Machines, rely heavily on surface-level textual features and fail to capture deep semantic relationships within email content. In this work, we propose a transformer-based email classification framework leveraging Bidirectional Encoder Representations from Transformers (BERT) for contextual representation learning. The model is fine-tuned on a labeled multi-class email dataset to perform categorization into classes including phishing, scam, advertisement, promotion, lottery, and legitimate emails. Text inputs are tokenized using the BERT tokenizer and transformed into dense contextual embeddings, which are subsequently passed through a task-specific classification layer. The system is evaluated using standard performance metrics such as accuracy, precision, recall, and F1-score. Experimental results indicate that the proposed approach outperforms conventional methods by effectively capturing bidirectional context and semantic dependencies, thereby improving classification performance and robustness in detecting sophisticated spam patterns. The model utilizes pre-trained transformer weights and is fine-tuned for domain-specific email classification tasks. Contextual embeddings generated by BERT capture semantic dependencies and improve classification robustness. The system reduces reliance on manual feature engineering by learning representations directly from raw text data. It is capable of handling imbalanced and complex email datasets with improved generalization performance.

290. HEALTH MONITORING AND ASSISTANCE DEVICE FOR PARALYZED PERSONS

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Paralysis is caused by severe nerve damage which completely affects a person's ability to communicate their basic needs. Patients with severe motor impairments often find it difficult to walk and hence require assistance for daily support. Apart from this, monitoring their health parameters also becomes crucial. Sudden drop-in heart rate or blood pressure could lead to fatal health conditions. This paper proposes a smart glove-based health monitoring system which effectively monitors body temperature using DHT11 sensor, heart rate and oxygen saturation using MAX30100 sensor and fall detection using MPU6050. Integration of five capacitive TTP223 touch sensors placed at the fingertip provides communication using predefined rules using single-tap and double tap inputs. Some of the predefined rules are requesting water, medicine or emergency assistance. All the alerts are displayed on a 16x2 LCD screen and sent to an IOT-based Blynk platform which provides instant notifications to caregivers if there is an emergency situation. The system is powered by 3.7V rechargeable lithium battery with a boost converter and hence it is an efficient health monitoring system which provides reliable and effective assistance to paralysed patients which in- turn improves the patient's quality of life.

291. PROACTIVE VIRTUAL MACHINE SCHEDULE ALLOCATION IN CLOUD PLATFORM

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Due to the nature of cloud computing systems of dynamism and unanticipated workloads, virtual machine (VM) scheduling must be efficient to maintain resource usage and Service Level Agreements (SLAs). Conventional reactive scheduling methods have a propensity to violate SLA and degrade performance since they employ static thresholds and wait to take remedial action until overload is recognized. This study presents a proactive system of allocating and scheduling virtual machines. The system can predict how future workloads will look and adjust schedules accordingly to ensure that no resources are being shared too early in conflict situations. Using real- time threshold adaptation, multi-timeframe trend analyses and real-time monitoring, the predictive modelling framework will allow the user to anticipate potential overloads before they occur. While guaranteeing real-time operation and transparent scheduling behavior in cloud settings, experimental evaluation findings confirm the decrease in SLA violations and optimized resources compared to reactive techniques.

292. ADVANCED MONITORING SYSTEM FOR ALZHEIMER'S PATIENTS

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Alzheimer's disease presents complex challenges that demand reliable, real-time health monitoring and support for both patients and caregivers. This paper introduces an integrated embedded IoT solution leveraging ESP32 microcontroller technology with a multi-sensor network, designed to monitor key patient vitals, medication intake, and movement within safe zones. The system incorporates pulse, temperature, and SpO_2 sensors to continuously track health status, while infrared and RF modules enable automated medication adherence monitoring and boundary detection. Facial recognition using Python-based AI enhances cognitive assistance, identifying caregivers and reducing patient anxiety. Sensor data and alerts are transmitted securely to a cloud app, allowing caregivers remote access via Blynk for instant feedback and timely intervention. Experimental trials demonstrate robust performance in vitals acquisition, event detection, and user-friendly app integration. This project provides a practical, scalable platform for Alzheimer care, promoting safety, independence, and improved quality of life for patients in diverse living environments.

293. MULTI-AGENT AI FRAMEWORK FOR SECURE MEDICAL DATA SHARING

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The digital transformation of healthcare systems has significantly increased the need for electronic medical data sharing. Modern healthcare environments involve heterogeneous volumes of data from hospitals, diagnostic centers, wearable devices, and remote monitoring systems. However, existing data-sharing framework rely on centralized architectures that often suffer from scalability limitations, interoperability challenges, and risks to patient privacy and data security. This paper proposes a Hybrid

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Intelligent Multi- Agent Framework (HIMAF) for efficient and secure electronic medical data sharing across distributed healthcare environments. The framework encourages autonomous and adaptive agents, namely data ingestion, anonymization, integration, learning, and decision-making agents, governed by a centralized control mechanism to ensure seamless interoperability and robust system orchestration. Experimental results demonstrate significant improvements in system performance, including reduced data exchange latency, enhanced interoperability efficiency, and strengthened data security compliance, while maintaining high accuracy in clinical decision support tasks.

294. SMART PARKING SYSTEM: A SOFTWARE BASED APPROACH FOR EFFICIENT PARKING MANAGEMENT

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The rapid growth of vehicles in urban areas has led to severe parking challenges, including congestion, time wastage, and inefficient space utilization. This paper presents Parkify, a web-based smart parking management system developed using modern full-stack technologies. Unlike traditional systems dependent on hardware or sensor-based detection, the proposed system focuses on a software- driven approach using Next.js, MongoDB, and API- based communication. The system enables users to view parking availability, book slots, and make secure online payments. Administrators can manage slots and monitor bookings efficiently. The solution improves parking efficiency, reduces manual effort, and supports scalable deployment in urban environments. The system is designed with a scalable architecture that supports efficient handling of multiple users and concurrent booking requests. It ensures secure data transmission through token-based authentication mechanisms. The integration of digital payment services enhances transaction reliability and user convenience. Furthermore, the

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modular design allows easy extension of advanced features such as real-time tracking and analytics. The proposed solution contributes to smart city development by promoting efficient parking management and reducing environmental impact.

295. HYBRID CLASSIFICATION-REGRESSION FRAMEWORK WITH OPTIMIZED DECISION THRESHOLDS FOR ORDINAL DIABETIC RETINOPATHY GRADING ON APTOS 2019

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Diabetic Retinopathy is a common cause of blindness, accounting for over 30% of 463 million patients diagnosed with diabetes worldwide. This article describes the creation of a hybrid classification-regression framework to classify Diabetic Retinopa- thy into five different grades using APTOS 2019. Specifically, the study uses an EfficientNet-B3 Backbone to create two heads: (1) classification using cross entropy (weight 0.6) and (2) regression using Smooth L1 (weight 0.4). Both categorical and ordinal classi- fication of severity are used simultaneously by running parallel computations through these two heads. To obtain optimal thresh- olds for decision making, the Nelder-Mead optimization method is used to maximize the Quadratic Weighted Kappa coefficient (QWK). The two-phase training strategy that uses progressive unfreezing and an ensemble of six models improve stability on pre-dictions made by the hybrid framework. QWK = 0.9131 ± 0.0015 was achieved through stratified 4-fold cross-validation of the hy- brid framework, while the maximum-performing ensemble had 86.08% accuracy and QWK = 0.9202, which exceeds any existing literature documenting QKW. A systematic analysis of misclas- sification shows that 85% of the misclassifications occur from adjacent grades with no extreme misclassification. Grad-CAM ++ visualizations validate that the hybrid framework focuses atten- tion on the appropriate region of the retina where the lesions are located.

296. AI-BASED VEHICLE ACCIDENT DETECTION AND AUTO-CLAIM SYSTEM

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The number of road accidents is going up fast and this is a big problem. We need systems that can detect accidents away and help people get medical care quickly. The old way of reporting accidents and dealing with insurance claims is slow. Relies too much on people doing things by hand. This can lead to people not getting help on time a lot of paperwork and fake insurance claims. Most systems that try to make vehicles safer only focus on tracking where they're navigating but they do not have a way to automatically check if an accident really happened and start the insurance claim process. This paper is about a system that uses Artificial Intelligence to detect vehicle accidents and automatically start the insurance claim process. This system combines sensors that are connected to the internet Global Positioning System tracking and Machine Learning algorithms to detect accidents away and automate what happens after an accident. The system is always checking how the vehicle is moving, looking for things like an impact the vehicle tilting in a weird way or a lot of vibration. If the system detects a collision it sends out real-time alerts with the location to people who need to know, like emergency contacts healthcare services, the police and insurance companies. The system uses Machine Learning to look at the patterns, from the sensors and make sure the accident really happened, which allows it to automatically start the insurance claim process and give an idea of how much damage was done. This system helps get people help faster reduces the amount of paperwork makes everything more transparent and prevents claims. We tested the system. Found that it can detect accidents reliably communicate with emergency services quickly and process claims efficiently. This system shows that Artificial Intelligence and the Internet of Things can be used to create vehicle safety systems that're smart, responsive and secure.

297. MULTIMODAL LEARNING FOR AUTISM DETECTION, EMOTION RECOGNITION, AND COGNITIVE ENHANCEMENT

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Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder marked by difficulties with social interaction, communication, emotional control, and behavioral patterns. Improving developmental outcomes requires early diagnosis and ongoing monitoring, but traditional assessment techniques mainly rely on labor-intensive, subjective, and time- consuming manual clinical observations. Although deep learning models have shown promise in behavioral analysis and medical image classification, single modal approaches are unable to fully capture the multi-faceted and intricate nature of ASD. An intelligent multimodal deep learning framework for early autism detection and individualized cognitive enhancement is presented in this paper. The suggested method incorporates the classification of brain scan images using Convolutional Neural Networks (CNNs), speech analysis using acoustic feature extraction in conjunction with Large Language Models (LLMs) for communication evaluation, and real-time facial emotion recognition using OpenC OpenCV-based computer vision techniques. To create adaptive recommendations that are customized to each user's needs, a multi-stage processing pipeline preprocesses images, extracts features, classifies emotions, and evaluates speech. To improve cognitive engagement and emotional stability, interactive therapeutic modules with activities centered around animals, color recognition, and pattern recognition are also included. The framework offers a scalable, automated, and non-invasive support system that can help clinicians, caregivers, and people with ASD. In comparison to single-modal systems, experimental validation shows how multimodal fusion improves detection reliability, emotional monitoring accuracy, and personalized intervention support

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298. DEEP LEARNING BASED DIAGNOSTIC SYSTEM FOR EARLY DETECTION OF MULTIPLE SCLEROSIS USING MRI & OCT DATA

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Multiple Sclerosis (MS) is a chronic, immune-mediated disorder of the central nervous system characterised by recurrent focal demyeli- nation and progressive axonal loss. Timely diagnosis is clinically essential, as early initiation of disease-modifying therapy substan- tially curtails long-term disability accumulation. Conventional MRI- centred workflows frequently miss subtle structural alterations at the earliest disease stages and are further hampered by scanner-protocol heterogeneity and significant inter-rater variability. Optical Coher- ence Tomography (OCT) of the retina has emerged as a sensitive, non-invasive surrogate biomarker through quantifiable thinning of the retinal nerve-fibre layer (RNFL) and the ganglion cell–inner plexiform layer (GC-IPL), changes that correlate closely with brain lesion burden and disability progression. This paper presents a confidence-aware multimodal deep learning framework that synergistically integrates MRI and OCT for early MS detection. Brain MRI volumes are nor- malised and sliced, then processed through frozen Swin Transformer (Tiny) and MobileNetV3-Large backbones to form a fused 4 096-D feature vector; a two-level stacking ensemble—XGBoost and Cat- Boost as base learners with a Random Forest meta-learner—yields a scalar MS probability pMRI. A confidence gate routes borderline cases ($0.2 \leq pMRI < 0.5$) to a fine-tuned EfficientNet-B4 OCT module; high-confidence MRI outputs bypass OCT entirely. The complete system is deployed as a Flask–React web application. On two external MRI benchmarks the ensemble achieves 98.9% accuracy (ROC-AUC ≈ 0.99). On a 515-scan OCT held-out set EfficientNet-B4 attains 92% accuracy with 0.93 precision, recall, and F1-score. The confidence- aware gate reduces missed MS diagnoses in borderline cases from 14.2% (MRI-only) to 4.2%, demonstrating a clinically meaningful advantage of the proposed adaptive architecture.

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299. DEEP LEARNING BASED MULTI-ORGAN SEGMENTATION IN MEDICAL IMAGING: AN INTEGRATED FRAMEWORK FOR CLINICAL DEPLOYMENT WITH COMPREHENSIVE PERFORMANCE ANALYSIS

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Tracing organ boundaries in CT and MRI volumes remains one of the most time-demanding tasks in a radiolo- gist's daily workflow—a single volumetric study can take 20– 30 minutes to annotate manually, and the resulting contours often differ measurably between examiners. To reduce that burden, we developed and evaluated a combined deep learning system that handles multi-organ segmentation and brain tumor classification within a single deployable pipeline. Segmentation is performed by a self-configuring nnU-Net; tumor typing is performed by an EfficientNetV2B2 network initialized from ImageNet. Incoming studies pass through z-score intensity nor- malization, isotropic 1 mm3 resampling, and non-local means denoising before inference. Experiments across three publicly accessible benchmarks—IBSR (18 volumes, 32 anatomical labels), OASIS (416 3D MPRAGE scans), and the Kaggle Brain Tumor Dataset (3,064 2D MRI slices)—yielded mean Dice scores of 0.92 for whole-body structures, 0.87 for brain-specific regions, and a tumor classification accuracy of 94.83%. On an NVIDIA RTX 3090, a full 3D volume is processed in approximately 4.2 seconds. Outputs are surfaced through a React-and-Flask web interface that writes segmentation masks to existing PACS systems via standard DICOM channels. When the IBSR-trained network was applied without modification to OASIS scans, the Dice held at 0.89—a result we attribute primarily to the preprocessing chain removing scanner-dependent intensity shift before inference. Against published baselines the proposed system surpasses 3D U-Net (Dice 0.88), FCN (Dice 0.86), Attention U-Net (Dice 0.90), and a ResNet50 classifier (93.5% accuracy).

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300. DRIVER DROWSINESS AND FACIAL EMOTION RECOGNITION SYSTEM USING VISION TRANSFORMER AND EAR+SVM MODEL

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Driver fatigue and emotional distress are one of the main causes of accidents. Drowsiness and emotional pressure also cause decrease in alertness, reaction time and delay in decision making power of the driver. The assessment of the driver in real time is essential to tackle this issue. Because of that, this paper presents a Driver Drowsiness and Emotion at real time. The system utilized a vision transformer (ViT) to capture global features from the driver's face, which effectively learns and incorporates long-range correlations in the features for reliable detection of drowsiness. An in- vehicle camera was constantly monitoring the reaction of a driver. The system also measured the eye closure time, blink rate, and facial movements of the users. To identify fear or drowsiness, EAR-based features from the driver's eyes are extracted for emotion recognition which is classified by SVM model. Depending on the driver condition, the system provides alert notifications and support for comfort and awareness. The experimental results yield excellent accuracy with low computation cost and stable real-time performance. To summarize, smart vehicles and ADAS will benefit from this proposed system implementation.

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