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SPECTRUM

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Spectrum is an e-magazine with the comprehensive collection of all the papers that have been published in our journal over the last two months — Volume 12, Issue 3 (May-June, 2026). This edition brings together 46 papers by 107 authors from 39 institutions. Each entry links to the abstract and the full paper.

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ABSTRACTS

1 MARG: Ikigai-Based Career Guidance System

Paper ID V12I3-1140 · Pages 1-6 · Computer Science & Engineering

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Career selection has become increasingly complex due to evolving industries and diverse opportunities. Many students face difficulty in identifying suitable career paths that align with their abilities and interests. This paper introduces MARG, a career guidance system that utilizes an Ikigai-based approach to evaluate user profiles across multiple dimensions. The system analyzes interests, skills, personality traits, and external factors to generate meaningful career recommendations. It further provides structured guidance through skill development plans and learning resources. The objective is to support informed decision-making while ensuring long-term satisfaction and adaptability. The proposed approach enhances clarity and enables individuals to explore career paths aligned with both personal goals and practical opportunities

Keywords: Career Guidance, Artificial Intelligence, Ikigai Framework, Personalized Recommendation System, Career Decision-Making, Student Development, Skill Mapping, Career Planning, Intelligent Systems, Job Market Analysis.

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2 Nuclear Households, Persistent Values: Urbanisation and Family Change in Contemporary India

Paper ID V12I3-1141 · Pages 7-10 · Sociology

Abhirath Mehta, Student, Prabhavati Padamashi Soni International Junior College, Maharashtra

This paper examines how urbanisation, economic change, and shifting cultural expectations have reshaped family life in Indian cities across three dimensions: household composition, gender roles, and intergenerational relationships. A structured literature review brings together canonical sociological frameworks, including those of Parsons, Oakley, and Giddens, alongside India-specific scholarship from Uberoi, Gupta, Shah, Desai, Rao, Chakrabarti, Manchanda, and Bhattacharya. Empirical grounding is provided by census data and a 2026 field study of 100 households in Yelahanka, Bangalore. The central finding is that nuclear residential forms have been widely adopted across urban India since 1991, but the obligations and values associated with joint family living have not collapsed alongside them. Women have entered paid employment in considerably larger numbers, yet domestic and caregiving responsibilities have not been redistributed in any proportionate way. Intergenerational financial transfers remain near universal, though physical distance has created measurable

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social isolation among elderly people in nuclear households. The paper concludes that urban Indian family change is best understood not as modernisation in the Western sociological sense, but as a process of structural adaptation in which residential forms shift while relational premises remain largely intact.

Keywords: Family Structures, India, Urban.

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3 Can SaMD Enhance Diagnostic Consistency and Turnaround Time in Resource-Constrained Public Healthcare Settings without Hardware Modification?

Paper ID V12I3-1146 · Pages 11-18 · Computer Science

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Long diagnostic turnaround times (TAT), equipment obsolescence, infrastructural inadequacies, and a lack of personnel are some of the ongoing issues facing resource-constrained healthcare systems. By integrating into current digital workflows, Software as a Medical Device (SaMD), especially AI-enabled systems, provides a scalable solution without necessitating changes to the underlying medical hardware. This study investigates whether SaMD may significantly increase turnaround time and diagnostic decision consistency in resource-constrained public healthcare settings. The results indicate that SaMD can greatly improve workflow efficiency and lower inter-operator variability. However, the main implementation obstacles continue to be algorithmic drift, regulatory fragmentation, cybersecurity concerns, and reimbursement constraints. The study concludes that SaMD is a workable, scalable solution for bolstering diagnostic systems in resource-poor areas when implemented through organised regulatory, financial, and cloud-based approaches.

Keywords: Software as a Medical Device (SaMD), Artificial Intelligence (AI), Diagnostic Decision Consistency, Digital Health Infrastructure, Public Health Technology Integration.

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4 AI Voice Agent-Based Virtual Interview Platform

Paper ID V12I3-1145 · Pages 19-22 · Artificial Intelligence Engineering

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A full-stack AI mock interview platform using Next.js, Tailwind CSS, Vapi for real-time voice interactions, and Firebase for backend services and authentication. The project guides developers through setting up the Vapi dashboard for AI agent creation and integrating Google Gemini for dynamic, tailored interview question generation based on user input role, level, and tech stack. Key features implemented include authenticating users, generating personalized interview scenarios, initiating real-time voice conversations with the AI agent,

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and saving transcripts. Additionally, the tutorial covers designing a professional UI to display past interviews and generating detailed feedback based on the conversation transcript. By the end of this comprehensive guide, learners will possess the practical skills to deploy a portfolio-worthy application that leverages real-time AI voice technology. This is a practical, project-based approach designed to help developers level up their skills with real-world scenarios.

Keywords: Natural Language Processing (NLP), Speech Recognition, Google Gemini API, Automated Feedback System, Real-Time Communication, Interview Preparation, Adaptive Question Generation.

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5 Perceived Parenting Skills Among Parents of Children Undergoing Surgery: A Descriptive Analysis

Paper ID V12I3-1144 · Pages 23-27 · Nursing

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Abstract: Surgery can be difficult for children and their parents. Effective parenting skills help to reduce the surgery-related discomfort and promote wellness and, consequently, favorable psychosocial surgical experiences for children. Most parents have anxiety before a pediatric surgical procedure. Parental anxiety may impair the parents' ability to cope with new or stressful situations while their children are undergoing surgery. Hence, in this study, the investigator has tried to assess the perceived parenting skills among parents of children undergoing surgery. Methods: This study was conducted using a descriptive correlational design among 100 parents of children undergoing surgery who met the inclusion criteria and were selected using a purposive sampling technique. Tools such as the demographic variable proforma of parents and children, and a rating scale to assess the perceived parenting skills were used. Results: The findings of the study revealed that the mean and standard deviation of the perceived parenting skills (M =32.93 & SD =3.30), indicating that most parents had consistently high levels of parenting skills with minimal variation among them. The association analysis reveals that among all selected background variables, mother’s occupation showed a statistically significant association with perceived parenting skills ($\chi^2 = 6.921$, $p = 0.008$). Overall, the study highlights the need for continued support and targeted interventions to further strengthen parenting skills and enhance child outcomes during surgery.

Keywords: Perceived Parenting Skills, Surgery, Children.

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6 Social Protection and Economic Marginality: A Study of Domestic Workers in Tamil Nadu

Paper ID V12I3-1142 · Pages 28-33 · Economics

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Domestic work represents a significant segment of the informal economy in India, particularly in Tamil Nadu, where women dominate this occupation. Despite their crucial role in sustaining households and supporting the urban and rural economy, domestic workers remain economically marginalized and socially excluded. This study examines the socio-economic conditions, income patterns, and access to social protection among domestic workers in Tamil Nadu, with specific reference to Namakkal District. Using a descriptive research design, primary data were collected from 120 respondents through structured questionnaires and interviews. Secondary data from government reports and scholarly studies were also used. The findings reveal that domestic workers face low wages, irregular employment, lack of legal protection, and limited access to welfare schemes. The study concludes that effective policy intervention, awareness, and inclusion in formal labour frameworks are essential to ensure economic security and social justice.

Keywords: Domestic Workers, Informal Sector, Social Protection, Economic Marginality, Tamil Nadu.

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7 CentralResume: A Unified Protocol for Structured Resume Management and Interoperable Job Profile Sharing

Paper ID V12I3-1151 · Pages 34-41 · Software Protocol

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Creating and maintaining job profiles across multiple recruitment platforms is a redundant process. Users are often required to manually enter the same information repeatedly on those platforms, which makes it difficult to update the information later, increasing the risk of inconsistent data. Additionally, job seekers frequently maintain multiple versions of resumes tailored for different roles or industries, where only a subset of the information differs. Managing these variations manually reduces maintainability and scattered files and information. Moreover, parsing resume PDFs is inherently unreliable due to formatting variations and the lack of a standardized structure. This paper proposes a standardized protocol for maintaining a centralized repository of structured resumes that solves all the mentioned problems. The system allows users to store their professional information in a single authoritative location while enabling multiple variants of resumes tailored to specific roles or contexts using tags with minimal effort. To support interoperability across recruitment platforms and to minimize parsing issues, we introduce a standardized JSON-based schema for representing resume data, along with a sharing protocol powered by OAuth that allows recruiters and job portals to access resume information in a structured way. By eliminating the need for repeated manual data entry and unreliable document parsing, the proposed approach improves data consistency, simplifies resume management, and

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enables seamless integration between job seekers and recruitment platforms. It saves time by making resume sharing as easy as logging in with Google.

Keywords: Centralized Resume Management System (CRMS), Structured Resume Data, Resume Standardization, JSON Resume Schema, Resume Interoperability, Applicant Tracking Systems (ATS), Resume Parsing, Dynamic Resume Generation, Persistent Resume Links, Tag-Based Resume Versioning, Resume Sharing Protocol, Professional Profile Management, Recruitment Platforms, Structured Data Exchange, Resume Data Portability.

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8 Udaan Path – Data visualization and Interest Prediction with AI integration

Paper ID V12I3-1147 · Pages 42-46 · Data Science

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Traditional student evaluation systems primarily focus on academic performance and often overlook individual interests, co-curricular involvement, and overall development. This paper presents UdaanPath, a Django-based educational data-driven web platform that uses the academic and non-academic performance data of students to make predictive calculations and provide career guidance for them using AI. We aim to give teachers and parents a tool that helps them to determine the best possible insights for a child. We implement the built-in administration panel of Django, which gives a dynamic manager tool to the school admin for administrative processes. We develop features like a personalised student dashboard, an AI-generated study plan for each student, a parent portal and career path suggestions in the project presented in this paper.

Keywords: Educational Analytics, Interest Prediction, Data Visualization, Django, Personalized Learning, Parent Portal, AI Study Plan Generation, Gemini API.

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9 Online Banking Services and Customer Retention in India

Paper ID V12I3-1152 · Pages 47-51 · Economics

Dr. V. Velvizhi, Assistant Professor, Government Arts and Science College, Tamil Nadu

The rapid advancement of digital technology has transformed the banking sector across the globe. In India, online banking services have become an integral part of financial transactions, enabling customers to access banking facilities conveniently and efficiently. The growth of internet penetration, smartphone usage, and digital payment systems has significantly contributed to the expansion of online banking. This study examines the relationship between online banking services and customer retention in India. It highlights the role of

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service quality, customer satisfaction, security, trust, and technological innovation in retaining banking customers. The paper also discusses the challenges faced by banks in maintaining customer loyalty in an increasingly competitive digital environment. The study concludes that effective online banking services enhance customer retention by improving convenience, reliability, and overall customer experience.

Keywords: Online Banking, Customer Retention, Digital Banking, Consumer Behaviour, Financial Technology, India, Customer Satisfaction.

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10 An IoT–AR Framework for Enhancing Interoperability for People with Disabilities

Paper ID V12I3-1155 · Pages 52-57 · Computer Engineering

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Advanced technologies continue to accelerate, particularly in the fields of the Internet of Things (IoT) and Augmented Reality (AR), which have demonstrated significant potential in assistive technologies. Globally, approximately 15% of the population lives with some form of disability, highlighting the urgent need for intelligent and accessible solutions. In Saudi Arabia, recent statistical reports indicate that 5.9% of Saudi citizens experience at least one mild physical difficulty, while 1.8% of the total population lives with at least one disability, with mobility and visual impairments among the most prevalent categories. To better understand real-world challenges, in 2024, an interview was conducted with a PhD holder with visual impairment, focusing on daily mobility challenges, current assistive technologies, and desired improvements. The findings revealed critical limitations in accuracy, response time, usability, and system integration. This paper analyzes existing AR–IoT assistive solutions and identifies key challenges, particularly latency, accuracy, and interoperability between heterogeneous devices and platforms. Current systems often require multiple software applications and hardware components, increasing complexity and cost. Therefore, this research proposes enhancing interoperability between AR and IoT technologies through a unified compatibility framework aimed at reducing system complexity, improving efficiency, and increasing accessibility for individuals with disabilities.

Keywords: Internet of Things (IoT), Augmented Reality (AR), Assistive Technologies, Interoperability, People with Disabilities, Human–Computer Interaction, Saudi Arabia.

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11 Digitalization of Payments and GDP- A Global Perspective

Paper ID V12I3-1161 · Pages 58-74 · Economics And Finance

Rishaan Lulla, Student, Bombay Scottish School, Maharashtra

This paper focuses on the growing importance of digital payment systems in facilitating the evolution of contemporary economies through increased efficiency and transparency in transactions as well as greater financial inclusiveness. Moreover, the comparison of the adoption and consequences of digital payments in advanced economies and EMDEs is analyzed. The development of technologies such as artificial intelligence and the Internet of Things contributes to increased efficiency, reliability, and safety of payments while posing

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threats that must be addressed. The paper considers the economic implications of digital payment systems, paying particular attention to their development in EMDEs, where the use of digital payments has been growing rapidly since 2014. In EMDEs, the percentage of adults using digital payments grew dramatically from 2014 to 2021. This paper considers the link between digital payment adoption and economic development by analyzing GDP per capita, total factor productivity, and employment in the informal economy. The paper also considers the role of central banks in fostering digital financial systems by providing efficient payment infrastructure and inclusive monetary policies. Overall, the study investigates whether digital payments have supported financial inclusion, economic modernization, and sustainable economic growth.

Keywords: Digital Payments, Cashless Economy, Financial Inclusion, Transaction Efficiency, GDP Growth, GDP Per Capita, UPI, Payment Cards, Internet Banking, Mobile Payments, Economic Development, Digital Infrastructure, Cybersecurity, Fraud Detection, Machine Learning, Artificial Intelligence, Internet of Things, Contactless Payments, Economic Indicators, Digital Adoption, Emerging Economies, Developed Economies, Data Privacy, Payment Systems, QR Code Payments, Real-Time Transactions, Mobile Wallets, Banking Access, Transaction Security, Digital Literacy.

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12 Online Banking Services and Customer Retention in India

Paper ID V12I3-1158 · Pages 75-79 · Economics

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The rapid advancement of digital technology has transformed the banking sector across the globe. In India, online banking services have become an integral part of financial transactions, enabling customers to access banking facilities conveniently and efficiently. The growth of internet penetration, smartphone usage, and digital payment systems has significantly contributed to the expansion of online banking. This study examines the relationship between online banking services and customer retention in India. It highlights the role of service quality, customer satisfaction, security, trust, and technological innovation in retaining banking customers. The paper also discusses the challenges faced by banks in maintaining customer loyalty in an increasingly competitive digital environment. The study concludes that effective online banking services enhance customer retention by improving convenience, reliability, and overall customer experience.

Keywords: Online Banking, Customer Retention, Digital Banking, Consumer Behaviour, Financial Technology, India, Customer Satisfaction.

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13 Scalable Quality-Aware Depth Map Generation Using Edge-Conditioned Deep Learning Priors

Paper ID V12I3-1168 · Pages 80-87 · Image Processing

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While monocular depth estimation remains a primary hurdle in computer vision, this research presents a sophisticated hybrid framework designed to extract high-fidelity depth information from static 2D images. The

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core of this methodology lies in its dual-stream architecture: it synchronizes a global depth hypothesis generated via Deep Learning with a localized, edge-sensitive segmentation strategy. To ensure the system remains versatile across a spectrum of hardware from high-performance servers to resource-constrained mobile devices, this work implements a quality-scalable block partitioning scheme. By discretizing the image into adjustable blocks, the system can dynamically balance computational overhead against spatial precision. This process is deeply informed by the luminance channel's edge probability, which acts as a structural guide to ensure that depth transitions are mathematically anchored to the actual physical boundaries of objects. To bridge the gap between discrete block processing and a continuous, natural depth field, a guided bilateral filter is employed in the final stage. This specific refinement serves two purposes: it effectively dissolves 'staircase' or blocky artifacts resulting from the segmentation, while simultaneously acting as a 'boundary-lock' to preserve the crispness of foreground silhouettes. The resulting depth maps exhibit a granular level of detail, particularly at high-resolution block settings—providing the necessary structural accuracy for seamless 3D conversion, cinematic depth-of-field effects, and high-immersion Augmented Reality (AR) environments.
GENERATION USING EDGE-CONDITIONED DEEP LEARNING PRIORS

Keywords: Monocular Depth Estimation, Deep Learning, Bilateral Filtering, Scalable Systems, Edge Detection.

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14 GovAI – Smart Government Scheme & Exam Finder Using Intelligent Eligibility Filtering

Paper ID V12I3-1167 · Pages 88-92 · Information Technology (computer Science)

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The increasing number of government welfare schemes and competitive examinations in India has made it difficult for citizens to identify opportunities suitable for their eligibility. Most users face challenges due to scattered information sources, a lack of awareness, and complex eligibility conditions. To solve this problem, the proposed project “GovAI – Smart Government Scheme & Exam Finder” provides a web-based recommendation platform that suggests suitable government schemes and competitive examinations based on user details. The system collects information such as age, income, gender, occupation, educational qualification, and state from users. Using eligibility-based filtering logic, the application recommends relevant schemes and examinations along with application links. The system is developed using Python, Flask, HTML, and CSS, and deployed online using GitHub and Render. The proposed platform reduces manual searching effort, improves accessibility, and provides a centralised solution for personalised recommendations. The project also demonstrates the practical use of intelligent filtering systems and modern web technologies in improving public service accessibility.

Keywords: Government Schemes, Recommendation System, Flask, Python, Eligibility Filtering, Web Application, Competitive Examinations, E-Governance, Citizen Support System.

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15 Review of Heart-Risk Monitoring System

Paper ID V12I3-1177 · Pages 93-96 · Healthcare

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Cardiovascular diseases continue to be among the major causes of death globally, hence making early diagnosis and monitoring crucial to enhance the quality of care. Systems that utilise electrocardiogram (ECG) signals together with artificial intelligence,e such as machine learning, deep learning, and the Internet of Things (IoT), together with wearable health devices, have revolutionised cardiac diagnostics in the contemporary age. In this literature review, there will be an extensive evaluation of new developments in ECG signal processing and arrhythmia detection techniques, wearable ECG monitors, and intelligent health applications. This work assesses different machine learning algorithms that include SVM, CNN, LSTM, MLP and hybrid deep learning algorithms that can be applied to classify ECG signals. Other areas that are covered include remote IoT healthcare systems, cloud computing based on ECG monitoring, explainable artificial intelligence models, FHIR interoperability standards and others. The strengths, limitations, data sets, pre-processing techniques, and results achieved by recent studies are reviewed.

Keywords: Heart Risk Monitoring, ECG, SpO_2, AD8232, MAX30102, ESP32, Machine Learning, IoT Healthcare, Cardiovascular Disease Prediction, Real-Time Monitoring.

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16 IoT-Enabled Smart Parking and Blind Spot Detection

Paper ID V12I3-1182 · Pages 97-100 · Iot And Embedded Domain

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Accelerating urbanisation, combined with a sharp rise in privately owned automobiles, has placed considerable pressure on city infrastructures, particularly with respect to parking management and vehicular safety.Locating an available parking slot consumes significant driver time, indirectly amplifying fuel usage, trafficdensity, and urban air pollution. Simultaneously, limited driver visibility around a vehicle—especially in blind-spot regions—continues to be a leading contributor to low-speed accidents during parking manoeuvres. Thispaper offers a thorough review of prevailing technological frameworks, with particular emphasis on deployingESP32 microcontrollers alongside arrays of heterogeneous sensors to achieve real-time proximity monitoringand obstacle awareness. The study traces the evolution from conventional camera-only solutions towardaffordable, omnidirectional IoT architectures designed to strengthen situational awareness comprehensively.Key findings underscore the value of ultrasonic sensing paired with cloud-connected dashboards andsmartphone interfaces in building a safer, fully networked vehicular ecosystem.

Keywords: Smart Parking, Internet of Things (IoT), ESP32, Ultrasonic Sensors, Blind Spot Monitoring.

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17 Comparative Evaluation of Machine Learning Approaches for Physiological Stress Detection Using ECG and EEG Signal Modalities

Paper ID V12I3-1185 · Pages 101-109 · Computer Science

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Stress is a complicated physiological and psychological phenomenon that has a huge impact on the health and performance of people. Conventional methods of measuring stress are dependent upon self-reports, making it difficult to determine if they are truthful and cannot be noted in real-time. In this study, the use of machine learning techniques to identify stress objectively based on physiological signals taken from ECG and EEG was examined. While other studies have only examined one signal type (either ECG or EEG), this study compared the two modalities side-by-side under the same experimental conditions, using equal amounts of data from publicly available datasets. Multiple machine learning models (Logistic Regression, Support Vector Machine, Random Forest, XGBoost, LSTM) were compared and contrasted using available datasets. Physiological signal features (heart rate variability, electrodermal activity) were taken into account and analysed to understand both autonomic and neural activation due to stress. The results demonstrated that the Random Forest model yielded the highest level of performance (F1-score=.86, AUC=.90), indicating that Random Forest is better suited to handling complex physiological signals than any other machine learning model. An analysis of the physiological signals indicated that stress causes a decrease in heart rate variability, an increase in skin conductance, and an increase in cardiovascular activity (during the physical response) due to increased sympathetic nervous system stimulation. In summary, this research points to machine learning-based techniques yielding dependable, non-invasive means for detecting stress. This research indicates that there is an opportunity to use physiologic signal analysis in combination with AI to provide future possibilities for monitoring mental health and wearable technology.

Keywords: Stress Detection, Machine Learning, ECG, EEG, Heart Rate Variability, Physiological Signals.

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18 A Comparative Review of Deep Learning Methods for Landmine Detection from Vision Transformers to Ground-Penetrating Radar

Paper ID V12I3-1180 · Pages 110-117 · Artificial Intelligence And Deep Learning For Remote Sensing

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Landmines present a real problem around the world, causing injuries and a real threat to deminers' lives. Due to that, the search for safe and efficient demining methods has been a humanitarian priority for a long time. Traditional methods rely on physical probing and manual demining. However, these methods give high false-alarm rates, risks, costs, and are time-consuming. Thus, there is an urgent need to find innovative technologies and study their potential to give 100% efficient solution. This paper provides a comparative review of recent research in landmine detection and classification, focusing on the application of Artificial Intelligence and Deep Learning. We will evaluate the number of recently used deep learning methodologies, datasets and achieved performance results. This will help identify how Artificial Intelligence can succeed in solving the problems of demining operations. In this study, we will analyse the use of different algorithms with the overall goal of specifying the best findings to ensure high territory clearance, as well as specifying the challenges. This review provides important insights into the current state of the field, highlighting solutions that can enhance demining operations and improve detection accuracy.

Keywords: Landmine Detection, Deep Learning, Computer Vision, Ground-Penetrating Radar (GPR), Thermal Imaging, Optical Imaging, Electromagnetic Induction (EMI), YOLO, Vision Transformer (ViT).

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19 Review of AI-Driven Methods to Enhance Search and Rescue Operations after Earthquakes

Paper ID V12I3-1179 · Pages 118-124 · Artificial Intelligence

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The devastating results of seismic events affect many people's lives every time they occur. The main damage is caused to people being trapped under the rubble for long periods of time because rescue teams lack intelligent and prioritised plans. To address this problem, we will study the utilisation of various artificial intelligence (AI) technologies in accelerating and enhancing the efficiency of human spotting and rescuing processes after earthquakes. These applications include neural networks, AI-controlled robot systems, and multimodal data fusion, where thermal, visual, and acoustic data are integrated to detect survivors under building debris, in addition to other fusion ideas. This review will focus on studies published between 2023 and 2026. One main outcome of this work is the identification of key limitations in current AI solutions, such as real-time processing constraints, the noisy nature of disaster environments, and hardware deployment challenges in active disaster zones. In conclusion, this review aims to serve as a future research direction for optimising AI-driven methods to enhance detection accuracy, accelerate rescue timelines, and improve the overall survival outcomes in seismic emergencies.

Keywords: Earthquake Search and Rescue, Deep Learning, Human Detection, Thermal Imaging, Rescue Robotics.

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20 Do ESG Rating Divergences Predict Stock Underperformance?

Paper ID V12I3-1169 · Pages 125-134 · Financial Economics

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While the ESG investing trend has shifted to the forefront, a rather worrying paradox is also becoming ever more evident, that of the dramatically divergent ESG evaluations rendered for the identical companies, consistently and by rating agencies across the industry. This paper investigates whether that difference of opinion, particularly when combined with unambiguous and highly optimistic environmental rhetoric in corporate filings, might be used as a quantifiable indicator of greenwashing, and if companies with that pattern of behaviour tend subsequently to underperform in equity markets. I employ a sample of 135 international firms from the S&P 500 and MSCI world indices, 2015-2023, providing a dataset of 1,080 firm-year observations. I calculated an aggregated ESG divergence index using pairwise disagreements from MSCI, Sustainalytics, and Bloomberg ESG ratings, and combined it with two text-based indicators from annual reports: a FinBERT sustainability sentiment index and a TF-IDF-based ESG keyword intensity measure for inclusion in my analysis. Ordinary Least Squares (OLS) regressions, two-way fixed effects panel models, and Fama-MacBeth cross-section estimation are used to carry out the empirical investigation. I find, throughout all specifications, that ESG rating divergence is negatively and significantly associated with risk-adjusted returns; each unit of added divergence relates to an annual excess return that is approximately 0.39–0.42% lower (p

Keywords: ESG Rating Divergence, Greenwashing, NLP, FinBERT, TF-IDF, Panel Regression, Fama MacBeth, Asset Management, Sustainable Finance, Factor Models, Python, Bloomberg ESG Ratings.

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21 Transformer-Based Object Detection Architectures for Autonomous Driving Perception: A Comprehensive Review

Paper ID V12I3-1176 · Pages 135-140 · Artificial Intelligence

Muhammad Hamza, Student, Qassim University, Saudi Arabia

Autonomous vehicle perception is one of the most important components in intelligent transportation systems, and the reliable trade-off between high fidelity of detection precision and computational efficiency in real time remains an open problem. Deep learning has proven to be very accurate in controlled settings, but bringing CNN-based solutions to deployment with high latency and substantial memory overhead is often a challenge to the end-to-end deployed Transformer solution. This thorough review provides a systematic analysis of recent developments in transformer-based detection architectures, consolidating 2024–2026 transformer- and CNN-based architectures for detection. It is a thorough review that systematically analyzes recent transformer-based detection architectures, summarizing the current transformer- and CNN-based detection architectures from 2024 to 2026. From our analysis, we can see that there is a clear lack of theoretical sophistication and the real-life edge-deployability of the hardware. In addition, there is a clear disconnection between the 2D camera-based detection approach and the 3D multimodal fusion approach in the literature. The critical research dimensions that are not well met by the current state-of-the-art are identified in this review, including small object detection in dense urban environments and robust inference under challenging weather conditions. This review provides a structured path forward by mapping these interrelated gaps and paving the way for the

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creation of lightweight, accurate and robust transformer detectors that can be deployed on their own in the field.

Keywords: Autonomous Driving, Object Detection, Detection Transformers (DETR), Vision Transformers (ViT), Real-Time Perception, Edge AI, Multimodal Fusion.

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22 Robust Deep Residual Networks with Pixel-Level Pre-Processing for Decentralized Traffic Sign Recognition

Paper ID V12I3-1194 · Pages 141-144 · Deep Learning

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While traffic sign recognition systems play a vital role in road safety and autonomous driving, traditional architectures often suffer severe accuracy degradation under adverse environmental conditions such as low light, fog, and heavy shadows. Although federated deep learning and convolutional neural networks (CNNs) have successfully advanced decentralized edge intelligence, standard RGB image processing remains a critical bottleneck for vehicles encountering environmental noise. To address this, we propose a lightweight, decentralized ResNet-34 architecture designed for embedded applications, enhanced by a robust multi-space pixel-level pre-processing pipeline. By incorporating localized edge contrast enhancement and chromatic variance stabilization (utilizing HSV and Ohta spaces), the proposed system isolates critical luminance and structural features prior to decentralized feature extraction. The framework was trained and evaluated on the German Traffic Sign Recognition Benchmark (GTSRB) and the Belgian Traffic Sign Data Set (BTSD). The results demonstrate that coupling dynamic image pre-processing with federated residual learning yields a highly efficient, accurate, and environmentally resilient system suitable for real-time edge deployment.

Keywords: Convolution Neural Network (CNN), Federated Deep Learning, German Traffic Sign Recognition Benchmark (GTSRB), Belgian Traffic Sign Data Set (BTSD).

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23 Edge-Optimized Pre-Trained Deep Learning Models for Real-Time Detection of Red Palm Weevil and Date Palm Diseases: A Review

Paper ID V12I3-1170 · Pages 145-150 · Machine Learning

Umar Faruk Ibrahim, Student, Qassim University, Saudi Arabia

Date palm (Phoenix dactylifera L.) constitutes one of the most economically and culturally significant crops across arid and semi-arid regions, yet its productivity faces existential threats from the Red Palm Weevil (Rhynchophorus ferrugineus, RPW) and a spectrum of fungal and bacterial diseases. While deep learning has demonstrated remarkable classification accuracies exceeding 97% in controlled laboratory environments, the transition from academic prototypes to deployable, real-time agricultural solutions remains critically underdeveloped. This comprehensive review systematically examines recent studies, synthesizing the current

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landscape of deep learning applications for RPW detection and date palm disease classification. Our analysis reveals a persistent disconnect between architectural sophistication and practical deployability. Furthermore, the literature exhibits a pronounced fragmentation between pest detection and disease classification, with few studies addressing the integrated palm health ecosystem. This review identifies critical research dimensions where the current state-of-the-art falls short. By mapping these interconnected gaps across the evaluated literature, this review establishes a structured roadmap for developing lightweight, accurate, and interpretable AI systems that bridge the gap between theoretical accuracy and operational feasibility in precision agriculture.

Keywords: Red Palm Weevil, Date Palm Disease, Edge Computing, Deep Learning, Transfer Learning, Model Compression, Explainable AI, Precision Agriculture, Real-Time Detection.

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24 A Review of Explainable Federated Learning Frameworks for Chest X-ray Diagnosis under Heterogeneous Hospital Data

Paper ID V12I3-1172 · Pages 151-159 · Artificial Intelligence

Muhammad Auwal Yusuf, Student, Qassim University, Saudi Arabia

The application of deep learning in chest X-ray diagnosis has demonstrated promising results in detecting multiple thoracic diseases. However, traditional centralized approaches face significant challenges, including limited generalization across hospitals with heterogeneous patient populations and imaging protocols, compounded by strict privacy regulations such as the Health Insurance Portability and Accountability Act (HIPAA) and the General Data Protection Regulation (GDPR) that prevent data sharing between institutions. Although centralized deep learning approaches perform well and achieve high local accuracy on their predictions, they are often “black boxes,” which limits clinical trust and interpretability. This review examines existing explainable federated learning frameworks for chest X-ray diagnosis under heterogeneous data conditions. Current approaches enable decentralized training across non-independent and identically distributed (non-IID) hospital environments, utilizing robust aggregation strategies such as Federated Averaging (FedAvg) and Federated Proximal (FedProx) to address label, quantity, and feature skew. To establish clinical trust, explainable Artificial Intelligence (XAI) techniques, such as Gradient weighted Class Activation Mapping (Grad CAM) and SHapley Additive exPlanations (SHAP), have been incorporated to generate interpretable visual explanations. The reviewed frameworks are evaluated on classification performance, robustness under heterogeneity, and stability of generated explanations. However, this review reveals significant gaps: the types of heterogeneity are addressed in isolation, XAI evaluation remains largely qualitative, and explanation stability under non-IID conditions lacks rigorous validation. These findings collectively highlight the need for federated frameworks that unify heterogeneity handling across all its forms simultaneously rather than addressing each in isolation, quantitative XAI assessment, and validation of explanation consistency across diverse hospital environments to enable trustworthy and interpretable clinical deployment.

Keywords: Federated Learning, Explainable AI, Chest X-Ray, Data Heterogeneity, Medical Imaging, Grad-CAM, SHAP, Non-IID, XAI.

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25 Hybrid Machine Learning and Deep Learning Approaches for Network Traffic Anomaly Detection: A Literature Review

Paper ID V12I3-1174 · Pages 160-164 · Anomaly Detection

Abdulhaq Nabizoi, Research Scholar, Qassim University, Saudi Arabia

Network traffic produces large volumes of data every second, and traditional security tools often struggle to detect new or unknown attacks hidden within this traffic. Anomaly-based intrusion detection systems address this problem by learning normal network behavior and identifying suspicious deviations. This literature review examines recent studies that use machine learning, deep learning, and hybrid machine learning-deep learning approaches for network traffic anomaly detection. The review focuses on feature selection, model complexity, dataset use, evaluation metrics, and the practical challenges that still limit real-world deployment. The reviewed studies show that traditional machine learning models can remain efficient when supported by careful feature selection, while deep learning models are useful for learning more complex spatial and temporal traffic patterns. Hybrid approaches often report stronger performance because they combine the speed and simplicity of machine learning with the representational power of deep learning. However, the literature also shows continuing weaknesses, including reliance on static benchmark datasets, class imbalance, computational cost, limited explainability, and uncertainty about performance in live networks. The review concludes that hybrid approaches are promising, but their future value depends on making them lighter, more explainable, and more reliable outside controlled experimental settings.

Keywords: Intrusion Detection System, Network Traffic, Anomaly Detection, Machine Learning, Deep Learning, Hybrid Models, Feature Selection.

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26 Security Challenges in Cross-Chain Asset Transfer Systems

Paper ID V12I3-1196 · Pages 165-177 · Blockchain Security And Interoperability

Kyrylo Sotnykov, Student, Independent Researcher, USA

The rapid growth of blockchain technologies and decentralized finance has significantly increased the demand for secure interoperability solutions between independent blockchain networks. Cross-chain asset transfer systems, commonly known as blockchain bridges, enable the movement of digital assets and data across multiple blockchain ecosystems, improving scalability, liquidity distribution, and usability of decentralized applications. However, the increasing adoption of cross-chain infrastructures has also introduced substantial security risks. In recent years, bridge-related exploits have resulted in financial losses exceeding billions of US dollars, making interoperability systems one of the most vulnerable components of decentralized ecosystems. This paper analyzes the primary security challenges associated with cross-chain asset transfer systems and examines the architectural characteristics of modern blockchain bridge solutions. The study reviews major bridge architectures, including lock-and-mint bridges, burn-and-release bridges, liquidity pool bridges, validator-based bridges, and light-client bridges. In addition, the paper investigates common attack vectors such as smart contract vulnerabilities, replay attacks, validator compromise, oracle manipulation, multisignature weaknesses, consensus desynchronization, and liquidity draining attacks. The research further evaluates several major bridge exploits, including the Ronin Bridge, Wormhole, and Nomad incidents, in order to identify

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recurring security weaknesses and operational failures. The paper also discusses mitigation strategies such as decentralized validation mechanisms, threshold signature schemes, formal verification, anomaly detection systems, transaction monitoring, and rate-limiting approaches. Finally, the study explores future research directions related to zero-knowledge interoperability systems, AI-based fraud detection, trust-minimized bridge architectures, and quantum-resistant cryptographic mechanisms. The findings demonstrate that achieving secure and scalable interoperability remains one of the central challenges in modern blockchain infrastructure development.

Keywords: Blockchain Interoperability, Cross-Chain Bridges, Decentralized Finance, Smart Contract Security, Blockchain Security, Validator Compromise, Cross-Chain Attacks, Interoperability Protocols, Decentralized Systems, Zero-Knowledge Bridges.

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27 Cyber Security Challenges and Protection Strategies in the Modern Digital Era

Paper ID V12I3-1183 · Pages 178-182 · Cyber Security

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The rapid expansion of digital technologies across the globe has made cybersecurity an essential component of modern society. As individuals, organizations, and governments increasingly rely on digital platforms, the frequency and complexity of cyber attacks have grown significantly. Threats such as ransomware, phishing schemes, zero-day vulnerabilities, and artificial intelligence–driven attacks continue to challenge existing security frameworks. This review paper examines the major cybersecurity challenges faced in the contemporary digital environment and evaluates current protection mechanisms, including artificial intelligence–based threat detection, encryption techniques, zero-trust security models, and blockchain-oriented solutions. The study adopts a comprehensive research approach that integrates technical analysis, threat modeling, real-world case studies, and human-factor considerations. The paper further highlights existing limitations in current security practices and identifies future research directions required to build secure and resilient digital ecosystems.

Keywords: Cyber Security, Digital Systems, Cyber Attacks, Zero Trust Security, Artificial Intelligence, Encryption Techniques, Cyber Defense Mechanisms, Information Security.

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28 **Association of Hypertension and Diabetes Mellitus with Reperfusion Timelines in STEMI Patients Undergoing Primary PCI at a Tertiary Care Cardiac Centre in Jodhpur, Rajasthan: A Prospective Observational Study**

Paper ID V12I3-1199 · Pages 183-187 · Medical

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Background ST-Elevation Myocardial Infarction (STEMI) remains one of the leading causes of cardiovascular morbidity and mortality worldwide. Timely diagnosis and early reperfusion therapy are the cornerstones of management and significantly influence clinical outcomes. Evaluation of demographic characteristics, cardiovascular risk factors, and reperfusion timelines is essential for improving quality indicators in acute cardiac care. Aim: To evaluate the demographic profile, cardiovascular risk factors, STEMI patterns, culprit vessel distribution, and reperfusion timelines among STEMI patients presenting to a tertiary care cardiaccentre. Materials and Methods This prospective observational study was conducted at Trinay Hospital, Jodhpur, Rajasthan. A total of 60 consecutive patients diagnosed with STEMI and undergoing primary percutaneous coronary intervention (PCI) were included. Data regarding demographic profile, cardiovascular risk factors, STEMI type, culprit vessel, door-to-ECG time, door-to-balloon time, and total ischemic time were collected using a structured STEMI data collection tool. Statistical analysis was performed using descriptive statistics.Statistical Data Analysis: Chi-Square Analysis of Hypertension and Diabetes Mellitus Correlation. A chi-squaretest was performed to determine the association between hypertension and diabetes mellitus among STEMIpatients. Table 1: Correlation Between Hypertension and Diabetes Mellitus Variable Diabetes Present DiabetesAbsent Total Hypertension Present 28 11 39 Hypertension Absent 9 12 21 Total 37 23 60 Statistical Findings •Chi-square (χ^2) value = 5.84 • Degrees of freedom = 1 • p-value = 0.015 Interpretation A statisticallysignificant association was observed between hypertension and diabetes mellitus among STEMI patients ($p < 0.05$). Patients with hypertension were more likely to have coexisting diabetes mellitus. Graphical AnalysisHistogram Analysis of Reperfusion Timelines The histogram demonstrated that total ischemic time remainedsubstantially higher than door-to-ECG and door-to-balloon times. Although in-hospital management timelineswere within acceptable international standards, delayed patient presentation contributed significantly toprolonged ischemic duration. Comparative Demographic Analysis Gender-wise Comparison Variable MaleFemale Mean Door-to-Balloon Time 79.4 minutes 84. Interpretation of Comparative Analysis Patients withdiabetes mellitus and hypertension demonstrated relatively prolonged ischemic times and delayed reperfusioncompared to patients without these risk factors. Female patients also showed slightly prolonged treatmenttimelines compared to male patients. Results: The mean age of patients was 56.7 ± 8.7 years. Male patientsconstituted 68.3% of the study population. Hypertension was present in 65%, diabetes mellitus in 61.7%,smoking history in 53.3%, alcohol consumption in 46.7%, and prior coronary artery disease in 25% of patients.Inferior wall STEMI was the most common presentation (45%), followed by anterior wall STEMI (36.7%). Theright coronary artery and left anterior descending artery were equally involved as culprit vessels (43.3% each).Mean door-to-ECG time was 12.48 minutes, while mean door-to-balloon time was 81.18 minutes. Mean totalischemic time was 282.6 minutes. Conclusion: STEMI predominantly affected middle-aged male patients withmultiple cardiovascular risk factors. Early reperfusion metrics observed in the present study were withinacceptable international standards for primary PCI centres. Continuous monitoring of STEMI timelines andquality indicators can further improve patient outcomes.

Keywords: STEMI, Primary PCI, Door-to-Balloon Time, Reperfusion Therapy, Acute Myocardial Infarction, Cardiology.

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29 AI-Driven Breath Analysis for Early Lung Cancer Detection Using Optimized Ensemble Learning of VOC Biomarkers

Paper ID V12I3-1201 · Pages 188-195 · Artificial Intelligence

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Lung cancer is one of the most prevalent and deadly diseases worldwide, primarily due to late-stage diagnosis and the limitations of conventional detection methods. Early and accurate identification is crucial for improving patient survival rates. This study proposes a novel, non-invasive approach for lung cancer prediction using AI-enhanced breath analysis based on volatile organic compound (VOC) biomarkers. The proposed system utilizes sensor-based breath data to capture VOC patterns associated with lung cancer. Advanced Preprocessing and feature selection techniques are applied to identify the most relevant biomarkers, reducing data complexity and improving model efficiency. An ensemble machine learning framework, combining multiple classifiers such as Random Forest, Support Vector Machine, and Gradient Boosting, is employed to enhance prediction accuracy and robustness. Experimental evaluation demonstrates that the proposed model achieves high accuracy, precision, and recall, outperforming individual classifiers. The system also shows strong potential for real-time implementation due to its computational efficiency. This approach offers a cost-effective, portable, and non-invasive alternative to traditional diagnostic techniques. Overall, the integration of VOC biomarker analysis with feature-selected ensemble learning provides a promising solution for early lung cancer detection, paving the way for improved screening methods and better clinical outcomes.

Keywords: Lung Cancer Detection, Breath Analysis, Volatile Organic Compounds (VOCS), Artificial Intelligence, Machine Learning, Ensemble Learning, Feature Selection.

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30 Real-Time Smart Road Accident Detection System Using IoT and Sensors for Faster Emergency Response

Paper ID V12I3-1171 · Pages 196-201 · Iot

Qutaiba Almassri, Research Scholar, Qassim University, Saudi Arabia

This literature review examines studies related to real-time smart road accident detection systems using IoT, sensors, communication technologies, and intelligent emergency response methods. The reviewed studies show that accident detection systems commonly use accelerometers, gyroscopes, GPS, GSM/GPRS, microcontrollers, cloud platforms, dashboards, and real-time alerting mechanisms to reduce delays in emergency notification. Some studies focus on low-cost vehicle-mounted systems, while others explore broader emergency response platforms, V2V/V2I communication, smart traffic lights, driver monitoring, and AI-based accident or incident detection. The reviewed studies also show that machine learning, deep learning, computer vision, YOLO-based models, and multi-agent systems can support accident recognition and traffic monitoring. However, several limitations remain, including limited real-world testing, false alarms, threshold sensitivity, weak emergency coordination, connectivity problems, limited sensor fusion, and security or privacy concerns. Overall, the reviewed studies support the need for a practical hybrid system that combines IoT-based sensing,

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location tracking, reliable communication, emergency alerting, and, where suitable, AI-based validation for faster and more reliable road accident response.

Keywords: Road Accident Detection, IoT, Sensors, Emergency Response, GPS, GSM, Smart Road, LoRa Communication.

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31 Lean Manufacturing Techniques to Enhance the Productivity of Base Coat Process in Automotive Lighting System

Paper ID V12I3-1206 · Pages 202-208 · Automotive

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Kaizen, a Japanese term meaning "change for the better," is a core Lean management philosophy focused on continuous, incremental improvement. Unlike radical overhauls, Kaizen emphasizes small, daily changes made by every employee—from the shop floor to the executive suite—to cumulatively drive significant gains in productivity and quality. As a Lean technique, Kaizen functions as the primary engine for eliminating waste (Muda), reducing variability, and optimizing process flow. It relies on a participatory culture where frontline workers are empowered to identify inefficiencies and propose solutions at the source of work, known as the Gemba. The methodology is typically operationalized through the Plan-Do-Check-Act (PDCA) cycle, ensuring that improvements are data-driven, tested, and standardized to prevent regression. The implementation of Kaizen within a Lean framework results in measurable benefits, including reduced lead times, lower defect rates, and enhanced employee morale. Ultimately, Kaizen transforms an organization into a "learning enterprise" capable of sustaining long-term competitive advantages without requiring massive capital investment.

Keywords: Kaizen, Coatings on the Teflector, Base-Coat Process, Decorative Coatings, Productivity, Lean Manufacturing.

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32 Lane Detection System using Python OpenCV

Paper ID V12I3-1211 · Pages 209-211 · Automation

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Lane detection is an important perception module in advanced driver-assistance and autonomous driving because it helps a vehicle interpret road geometry and remain centered within the lane. This paper presents a compact lane detection pipeline developed in Python with OpenCV using classical image-processing techniques. The method processes each video frame in sequence and applies grayscale conversion, Gaussian smoothing, Canny edge detection, a region-of-interest mask, and Probabilistic Hough Transform line extraction. The detected segments are separated into left- and right-lane candidates using slope-based rules, averaged to reduce noise, and drawn on the original frame to create an annotated road view. The system was tested on real driving video captured from a front-facing camera under normal daylight conditions. The results indicate that the approach performs well on straight roads and moderate curves when lane markings are visible, but its robustness decreases under shadows, glare, faded paint, and partial occlusion. Because the pipeline is

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lightweight, deterministic, and capable of near real-time execution on standard hardware, it is a useful baseline for educational and prototype intelligent transportation systems. The paper also discusses the problem context, design objectives, implementation steps, results, limitations, and future extensions such as adaptive thresholding, temporal tracking, and learning-based lane recognition.

Keywords: Lane detection, OpenCV, Python, Canny edge detection, Hough Transform, ADAS.

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33 Deep Learning Based Non-Invasive Screening of Autism Spectrum Disorder Using Transfer Learning

Paper ID V12I3-1213 · Pages 212-214 · Machine Learning

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Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition characterized by persistent challenges in social communication. Early intervention is paramount; however, traditional diagnostic pathways often take years due to a lack of specialized clinicians. This research proposes an automated screening tool using facial image analysis. By employing the VGG16 architecture via Transfer Learning, we extract high-level spatial features from facial landmarks to identify markers associated with ASD. Our findings indicate that computational models can provide a significant preliminary screening layer, reducing the burden on clinical resources.

Keywords: Autism Spectrum Disorder (ASD), Deep Learning, Transfer Learning, VGG16 Architecture, Facial Image Analysis.

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34 Vehicle Breakdown Assistance Management System

Paper ID V12I3-1215 · Pages 215-218 · Computer Science And Engineering

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Vehicle breakdown situations often create inconvenience, delays, and safety concerns for drivers. In many traditional cases, assistance is arranged manually through phone calls or local contacts, which may consume time and create communication gaps. This paper presents a Vehicle Breakdown Assistance Management System (VBAMS) developed using the Python Django framework and MySQL database, based directly on the implemented project model. The system provides a centralized platform where customers can submit assistance requests, administrators can manage bookings and drivers, and assigned drivers can update service progress. The project follows Django's Model-View-Template (MVT) architecture and includes secure authentication, role-based access, driver management, booking records, and request tracking. The developed system improves operational efficiency, organizes service data, and reduces manual coordination. Future scope of the project includes GPS tracking, artificial intelligence based dispatching, mobile application support, and automated notifications.

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Keywords: Vehicle Breakdown, Roadside Assistance, Django, MySQL, Booking System, Driver Management, Web Application

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35 Gesture to Voice: A Real-Time Arabic Sign Language Recognition System for Spoken Saudi Arabic Output

Paper ID V12I3-1214 · Pages 219-222 · Artificial Intelligence

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Communication barriers between deaf individuals and the general public remain a persistent challenge in Arabic-speaking communities. This paper presents Gesture to Voice, a real-time Arabic Sign Language (ArSL) recognition system that translates hand gestures into spoken Saudi Arabian audio output. MediaPipe extracts 21 hand landmarks per hand (126 features total), and a Long Short-Term Memory (LSTM) neural network processes temporal sequences of 30 consecutive frames to classify gestures. A two-stage prediction stabilization mechanism combining confidence thresholding and majority voting ensures reliable output. The system achieves a best validation accuracy of 84.26% and reliable real-time performance across three gesture classes. Unlike prior work producing text-only output, Gesture to Voice uniquely delivers spoken SaudiArabianc responses, addressing a critical gap in localized assistive technology.

Keywords: Arabic Sign Language, Saudi Arabic, Gesture Recognition, LSTM, MediaPipe, Deep Learning, Computer Vision, Speech Output, Assistive Technology, Real-Time Recognition.

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36 Experimental investigation on Utilization of Recycled PET Fiber in Concrete

Paper ID V12I3-1218 · Pages 223-226 · Civil Engineering

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This paper presents an experimental investigation on the utilization of recycled Polyethylene Terephthalate (PET) bottle fibers in M35 grade concrete. The increasing generation of plastic waste has become a serious environmental issue due to its non-biodegradable nature and improper disposal methods. The use of recycled PET fibers in concrete offers an effective solution for waste management while enhancing the mechanical properties of concrete. In this study, waste PET bottles were collected, cleaned, and cut into fibers of suitable dimensions before being incorporated into concrete at varying percentages of 0%, 1%, 2%, and 3% by weight

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of cement. Concrete specimens were prepared and tested to evaluate compressive strength, split tensile strength, and flexural strength after standard curing periods. The experimental results indicated that the inclusion of PET fibers improved the overall performance of concrete by enhancing crack resistance, tensile strength, and flexural behavior. The fibers acted as crack-bridging elements, reducing the propagation of microcracks and improving the ductility of concrete. Among the different mixes, the optimum PET fiber content exhibited the best mechanical performance. The utilization of PET fibers also contributes to sustainable construction practices by reducing plastic waste accumulation and promoting the recycling of non-biodegradable materials. The findings of this study demonstrate that recycled PET fiber reinforced concrete can be considered a viable and eco-friendly construction material. Therefore, the incorporation of PET fibers in concrete not only improves structural performance but also supports environmental sustainability and effective plastic waste management in the construction industry.

Keywords: PET Fiber, Recycled Plastic Bottles, Fiber Reinforced Concrete, Compressive Strength, Split Tensile Strength, Flexural Strength, Sustainable Construction.

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37 Artificial Intelligence and Risk Management in Digital Banking Services: Opportunities, Challenges, and Future Perspectives

Paper ID V12I3-1219 · Pages 227-230 · Commerce

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The rapid growth of digital banking has transformed the financial services sector by enhancing accessibility, efficiency, and customer experience. Simultaneously, the increasing dependence on digital platforms has exposed banks to various risks, including cyber threats, operational failures, fraud, data breaches, and regulatory compliance issues. Artificial Intelligence (AI) has emerged as a significant technological solution for identifying, assessing, and mitigating these risks. This paper examines the role of AI in risk management within digital banking services. The study explores AI-based applications such as fraud detection, predictive analytics, credit risk assessment, anti-money laundering systems, and cybersecurity monitoring. The paper also highlights challenges associated with AI adoption, including algorithmic bias, privacy concerns, regulatory issues, and technological dependence. Based on a review of contemporary literature and industry practices, the study concludes that AI significantly enhances the effectiveness of risk management while requiring appropriate governance frameworks to ensure ethical and secure implementation.

Keywords: Artificial Intelligence, Digital Banking, Risk Management, Cybersecurity, Fraud Detection, Financial Technology.

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38 Sadhu Om Swami – His Life and Poetic Compositions

Paper ID V12I3-1226 · Pages 231-234 · Bharatanatyam

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Sadhu Om was a poet from Punnai Nallur, a famous kshetra, 2 miles from Thanjavur in Tamil Nadu. Even from his childhood Natarajan was naturally blessed with ‘asu kavitvam’ as it called. He could spontaneously compose poetry. He had great love for Lord Muruga and many songs in His praise flowed from him. As he was a good singer as well, he would joyously sing these songs. At the age of 24, (i.e., in 1946) he happened to come across and read the book ‘Sri Ramana Vijayam’, a Tamil biography of Ramana. This attracted his heart and he yearned to have Darshan of Bhagavan Ramana. He had the darshan of Ramana and was lost in his presence. Natarajan arrives with a song “Kuyil Vidu Thoodhu” and starts singing it before Bhagavan Ramana. Soon he started finding his job at the Thanjavur Collector’s Office a hindrance to his spiritual pursuit and resigned from it. Sri Sadhu Om’s association with Ramana Maharshi lasted four years from July 1946 until Ramana’s Mahasamadhi in April 1950. Sri Muruganar, often regarded as one of Ramana’s foremost disciples, designated Sri Sadhu Om as his literary executor. Sadhu Om had exclusive devotion to Bhagavan and regularly went for the giri-pradakshina, the circumambulation of the sacred Arunachala, Annamalai. He talked about the boundless merits of the Giri valam and created an awareness of its auspiciousness in Western seekers and other Bhagavan devotees. Dedicating his life to the twin purposes of composing hymns on Bhagavan and performing giri - pradakshina, Sadhu Om merged in Bhagavan’s grace on 17-3-1985.

Keywords: Sadhu Om Swami (Birth Name: Natarajan), Ramana Maharshi, Muruganar, Arunachala / Tiruvannamalai, Tamil Devotional Poetry, Ramana Geetham, Bhakti And Jnana, Carnatic Music Influence

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39 Solar-Powered Touchless Doorbell for Home and Industrial Applications

Paper ID V12I3-1217 · Pages 235-240 · Electrical And Electronics Engineering

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This project presents a Solar-Powered Touchless Doorbell for home and industrial applications using renewable energy and contactless sensing technology. An IR sensor detects the presence of a hand and activates the doorbell without physical contact, improving hygiene and convenience. The system is energy-efficient, cost-effective, and suitable for modern smart environments.

Keywords: Solar Energy, Touchless Doorbell, IR Sensor, Home Automation, Industrial Application

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40 Serial Position Effect: The Causes of Forgetting

Paper ID V12I3-1229 · Pages 241-248 · Psychology

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This study investigated the effect of loud rock music on memory recall using the Serial Position Effect. Participants were divided into two groups: one completed a word recall task in silence, while the other completed the same task while exposed to loud rock music. The study examined the primacy and recency effects by analyzing the number of words recalled from the beginning and end of a word list. Results showed that participants in the silent condition demonstrated stronger recall and a clearer serial position curve compared to those exposed to loud music. The findings suggest that loud background music interferes with attention, encoding, and retrieval processes, thereby reducing memory performance. These results highlight the influence of environmental distractions on cognitive functioning and learning.

Keywords: Memory, Serial Position Effect, Primacy Effect, Recency Effect, Memory Recall, Loud Rock Music, Attention, Encoding, Retrieval, Cognitive Psychology, Environmental Distractions, Short-Term Memory.

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41 Comparative Assessment of Deep Learning Architectures for Urban Feature Extraction in ArcGIS Pro: U-Net vs. DeepLabV3+

Paper ID V12I3-1230 · Pages 249-253 · Gis

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The rapid development of deep learning has fundamentally transformed the way urban features are extracted from remotely sensed imagery. Among the most widely adopted architectures for semantic segmentation tasks in geospatial analysis are U-Net and DeepLabV3+, each offering distinct approaches to pixel-level classification. This paper presents a comparative theoretical and methodological assessment of both architectures in the context of urban land cover feature extraction, with specific reference to their implementation within ArcGIS Pro — a leading commercial GIS platform that natively supports deep learning workflows. The analysis focuses on architectural design principles, segmentation performance metrics reported in the literature, and the practical feasibility of deploying each model in an urban GIS environment such as the city of Plovdiv, Bulgaria. Results from existing studies indicate that both architectures achieve competitive accuracy on urban datasets, with U-Net demonstrating strengths in boundary-sensitive tasks and DeepLabV3+ excelling in multi-scale contextual feature capture. The study discusses the implications for GIS practitioners seeking to integrate deep learning into operational workflows using ArcGIS Pro tools.

Keywords: Deep Learning, Semantic Segmentation, U-Net, Deeplabv3+, Urban Feature Extraction, Arcgis Pro, Land Cover Classification, GIS

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42 Applications of Lean Manufacturing Techniques to Enhance the Productivity of the Base Coating Process

Paper ID V12I3-1223 · Pages 254-261 · Automotive Lighting - Reflector Basecoat Process

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Lean manufacturing techniques have increasingly been adopted in the automotive lighting sector to enhance efficiency, reduce waste, and improve product quality. This project explores the application of Lean methodologies in automotive lighting production, focusing on key practices such as value stream mapping, and continuous improvement (Kaizen). By analysing case studies from leading automotive lighting manufacturer (Varroc Engineering), the study highlights how these practices evaluate waste, streamline operations, minimize process costs, and enhance productivity. The integration of Lean principles not only optimizes the manufacturing process but also fosters a culture of innovation and responsiveness to organizational demands. Furthermore, the Project discusses the challenges faced in implementing Lean practices within this specialized field and offers strategies for overcoming these obstacles. Ultimately, the findings underscore the significance of Lean manufacturing in enhancing competitiveness and sustainability in the automotive lighting industry.

Keywords: Kaizen, Coatings on the Reflector, Base-Coat Process, Decorative Coatings, Productivity, Lean Manufacturing

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43 Design Systems for High-Volume Digital Marketing: A Framework for Creative Consistency and Production Efficiency

Paper ID V12I3-1233 · Pages 262-265 · Design Systems

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High-volume digital marketing requires design teams to produce a large number of creative assets across formats, channels, campaigns, and markets while maintaining visual consistency and production quality. Traditional brand guidelines are often not enough to support this level of scale because they usually define visual identity but do not explain how creative production should operate in daily workflows. This paper proposes a conceptual framework for using design systems in high-volume digital marketing environments. The framework includes brand principles, visual rules, asset hierarchy, localization logic, production workflow, and review checklists. It argues that design systems should function not only as visual reference documents, but also as operational tools that help teams improve consistency, reduce rework, support localization, and increase production efficiency. The paper also discusses the role of design leadership in building scalable creative systems that connect visual quality with business outcomes

Keywords: Design Systems, Digital Marketing, Creative Production, Brand Consistency, Localization, Production Workflow, Design Leadership, Visual Communication

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44 Impact of Socioeconomic Challenges on the Academic Performance of Students in Selected Colleges of Education in Borno State, Nigeria

Paper ID V12I3-1234 · Pages 266-270 · Education

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ABSTRACT Academic performance in higher education is influenced by socioeconomic conditions. This study examined the impact of socioeconomic challenges on the academic performance of students in selected Colleges of Education in Borno State, Nigeria. A descriptive survey design was adopted. From a population of 5,800 students, 300 respondents were selected using simple random sampling. Data were collected with the Socioeconomic Challenges and Academic Performance Questionnaire (SCAPQ) and analysed using descriptive statistics, the Independent Samples t-test, and Simple Linear Regression at the 0.05 level of significance. Findings showed that respondents experienced socioeconomic challenges and perceived them as influencing academic performance, although statistical analyses indicated that socioeconomic challenges were not significant predictors of academic performance. The study recommends strengthening scholarships, welfare services, and learning resources.

Keywords: Socioeconomic Challenges, Academic Performance, Colleges Of Education, Borno State, Nigeria.

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45 Prediction of migraine onset using AI to analyse Digital Biomarkers

Paper ID V12I3-1239 · Pages 271-289 · Neuroscience

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Background: Migraine is a highly prevalent neurological disorder characterized by an unpredictable prodromal phase, during which subtle physiological and behavioral changes precede headache onset. Advances in digital phenotyping and artificial intelligence (AI) offer the potential to detect these changes through passive data collected from smartphones and wearable devices. Methods: This study investigated the feasibility of predicting migraine onset using machine learning models trained on digital behavioral biomarkers. A publicly available dataset comprising 11,879 daily observations from 100 users (January–August 2024) was analyzed. Features included sleep duration, screen time, stress, mood, hydration, and engineered temporal variables such as lag features, rolling averages, and composite risk scores. Logistic Regression, Random Forest, and Gradient Boosting models were developed and evaluated using ROC-AUC, average precision, precision, recall, and five-fold cross-validation. Additionally, a primary survey explored self-reported changes in typing speed and typing errors during the migraine prodromal phase. Results: All three models demonstrated predictive performance above chance, with Random Forest achieving the strongest overall performance (ROC-AUC = 0.674; accuracy = 61.8%). Temporal behavioral patterns were more informative than same-day measurements, with previous-day stress, sleep duration, and composite risk scores emerging as the most influential predictors. Survey findings indicated that approximately 29% of participants perceived slower typing before migraine onset, supporting typing dynamics as a potential digital biomarker, although most participants were unable to reliably recognize

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prodromal changes without objective monitoring. Conclusion: AI-based analysis of digital biomarkers can identify meaningful behavioral patterns preceding migraine attacks and may enable passive early-warning systems. Although current predictive accuracy is insufficient for standalone clinical use, integrating longitudinal digital phenotyping with explainable, personalized machine learning models could substantially improve proactive migraine management and reduce disease burden.

Keywords: Migraine Prediction, Machine Learning, Wearable Biosensors, Signal Feature Extraction, Feature Ranking, Sleep Analysis, Nocturnal Monitoring

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46 The Consumer Who Was Once the King of the Market Has Become the Victim of It: A Critical Study on Consumer Exploitation and the Effectiveness of Consumer Protection Mechanisms in India.

Paper ID V12I3-1235 · Pages 290-304 · Business Studies

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Consumers have long been regarded as the foundation of every market, with businesses producing goods and services to meet their needs and preferences. This traditional view gave consumers the status of the "king of the market." However, rapid industrialization, globalization, technological advancements, and the growth of digital commerce have significantly changed this relationship. Today, consumers face numerous challenges, including misleading advertisements, counterfeit products, online fraud, hidden charges, unfair trade practices, and misuse of personal data. These issues have increased consumer vulnerability and raised concerns about the effectiveness of existing consumer protection mechanisms. India has introduced several legal measures to safeguard consumer interests, most notably the Consumer Protection Act, 2019. While the legislation provides consumers with important rights and establishes mechanisms for grievance redressal, the increasing complexity of modern markets continues to pose new challenges. Many consumers remain unaware of their legal rights, and issues such as cyber fraud, deceptive online marketing, and delays in dispute resolution continue to affect consumer confidence. The present study aims to examine the changing position of consumers in the Indian marketplace by exploring the different forms of consumer exploitation and evaluating the effectiveness of consumer protection mechanisms. A descriptive cross-sectional research design will be adopted using a quantitative approach. Primary data will be collected through a structured questionnaire administered to consumers, while secondary data will be gathered from books, research articles, government reports, and relevant legal documents. The study is expected to assess consumer awareness regarding their rights, identify the major challenges faced by consumers in both traditional and digital markets, and evaluate the effectiveness of existing consumer protection systems. Based on the findings, the study will suggest practical recommendations to strengthen consumer awareness, improve the implementation of consumer protection laws, promote ethical business practices, and enhance consumer welfare. It is also expected to contribute to the existing literature by providing a comprehensive understanding of the evolving consumer-market relationship in India.

Keywords: Consumer Protection, Consumer Exploitation, Consumer Rights, Consumer Protection Act 2019, Consumer Awareness, Digital Commerce, E-commerce, Unfair Trade Practices, India.

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