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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 11, Issue 5 (September-October, 2025). This edition brings together 56 papers by 115 authors from 66 institutions. Each entry links to the abstract and the full paper.

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ABSTRACTS

1 A Deep Dive into the Adversarial Training Process of Modern LLMs

Paper ID V11I5-1137 · Pages 1-15 · Computer Science

Armaan Mahajan, Student, Pathways School Gurgaon, Haryana

Large language models can be trained to resist jailbreak attempts in order to ensure the model's safety. This literature review analyzes common adversarial training techniques used in modern LLMs to understand and break down the process of adversarial training. The paper looks into 6 training techniques, ranging from PGD to Deployment Time Safety Layers and Model Editing. For each method, we look into how they work behind the scenes, their strengths, weaknesses, and real-world usage. We then synthesize the most effective manner of training models against adversarial inputs. This research revealed that the most effective training technique emphasizes a multilayered defense strategy. Future research can look at improving model-editing coverage, creating open-sourced LLM benchmarks to test against jailbreaks, and closing the divide between embedding-space and discrete input training.

Keywords: LLMs, Adversarial Training, Artificial Intelligence, RLHF, ChatGPT, Jailbreaking, Lat.

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2 Performance Overview of Light Electric Vehicle Powered by Battery in Assistance with Supercapacitor

Paper ID V11I5-1141 · Pages 16-21 · Electric Vehicles

Amit Aundhakar, Student, MIT Art, Design and Technology University, Maharashtra
Sateesh Patil, Professor, MIT Art, Design and Technology University, Maharashtra
Shashank Gawade, Professor, MIT Art, Design and Technology University, Maharashtra

The growing electrical vehicle (EV) market has been taking the attention of customers & manufacturers in the last couple of years. EVs with lithium-ion (Li-ion) batteries stand as an alternate to the conventional power source of fossil fuel engines. While sustaining the stand, the limitations of battery as a sole power source surface, like range, temperature, state of health, dynamic power requirement & addressing different duty cycles. In this regard, a hybrid power source with a supercapacitor has emerged as a solution. The combined power source is known as a hybrid energy storage system (HESS). In this report we will see the current progress in technology for the supercapacitor-based powertrain from the viewpoint of range, charge-discharge cycle, overall weight of power source, power split strategies & ultimate cost impact. The HESS has basically three configurations—passive, semi-passive & active. The efficiency of the system improves with the introduction of power electronics. Comparative analysis of passive, semi-passive, and active HESS architectures confirms the superiority of active systems, which enable intelligent power-split strategies through advanced power electronics. Although they involve higher initial costs, lifecycle evaluations highlight reduced battery replacement frequency and lower operating expenses. This study establishes actively managed HESS as a scalable and sustainable solution for three-wheeler electrification, combining enhanced performance and long-

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term durability.

Keywords: Hybrid Powertrain, Lithium-Ion Battery, Supercapacitor, HESS, Energy Management, Indian Driving Cycle, Regenerative Braking, Three-Wheeler EV.

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3 A Comparative Study of Machine Learning Algorithms for Real-Time DDoS Detection in Cloud Environments

Paper ID V11I5-1146 · Pages 22-39 · Cloud Computing And Security

Oduwunmi Odukoya, Research Scholar, East Tennessee State University, Tennessee
Mariam Adetoun Sanusi, Research Scholar, University of Texas, Dallas
Samuel Adenekan, Student, East Tennessee State University, Tennessee

Cloud environments are scalable and cost-effective, but they are also highly susceptible to cyberattacks, such as Distributed Denial of Service (DDoS) attacks, which can exhaust resources and impact availability. To counter these threats, this research investigates supervised machine learning techniques for identifying such attacks in real-time based on the BCCC cPacket Cloud DDoS 2024 dataset. Following deep preprocessing and exploratory data analysis, a multi-class classifier was employed to differentiate between benign, suspicious, and attack traffic. Of the models to be compared, the Decision Tree Classifier achieved the highest mark with an accuracy rate of 96.8 percent, which indicates its ability to categorize the majority of cases of traffic accordingly. The other models, including K Nearest Neighbors, Ridge Regression, Logistic Regression, and Linear Support Vector Classifier, had lower levels of accuracy, with Decision Tree always delivering the best. The results confirm that the Decision Tree is the best and most efficient model for precise real-time identification of DDoS attacks in cloud systems.

Keywords: DDoS, Cloud Environment, Machine Learning, Cyber-Attack.

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4 Crypto & Traditional Banking: An Evolving Relationship

Paper ID V11I5-1142 · Pages 40-42 · Banking

Nitant Kalia, Student, Panjab University, Punjab

The rapid rise of cryptocurrencies over the past decade has catalyzed a major shift in the global financial landscape. Once niche digital experiments, cryptocurrencies powered by blockchain and tokenization technologies have now achieved wider recognition across institutional investors, fintech innovators, and even central banks. A 2025 survey by EY and Coinbase revealed that 83% of institutional investors plan to increase their digital asset allocations, driven by growing regulatory clarity and product innovation.

Keywords: Cryptocurrency, Defi, Traditional Banking, Blockchain, Financial Transformation.

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5 Real-Time Football Player and Ball Detection System Using YOLO Architecture for Automated Sports Analytics

Paper ID V11I5-1138 · Pages 43-54 · Computer Vision

Aryan Lalwani, Student, Independent Researcher

This paper presents a comprehensive AI-powered football analysis system that employs the YOLO (You Only Look Once) detection framework to achieve real-time identification and tracking of players, balls, and referees in football match videos. The system integrates computer vision techniques, including team classification through K-means clustering, optical flow for camera motion compensation, and homography transformation for perspective correction. Our implementation achieved remarkable performance metrics with 82.2% mAP50, 90.2% precision, and 77.0% recall across all object classes. The system successfully processes raw match footage to generate automated analytics, including player tracking, speed calculation, distance metrics, and possession statistics, offering an economical substitute for expensive GPS-based tracking systems used in professional sports.

Keywords: Computer Vision, YOLO, Object Detection, Sports Analytics, Player Tracking, Machine Learning, OpenCV.

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6 IoT-Enabled Smart Home Gardening System: An Innovative Approach to Water Conservation and Plant Care

Paper ID V11I5-1149 · Pages 55-58 · Internet Of Things

Debjyoti Mukhopadhyay, Student, Pimpri Chinchwad College of Engineering, Maharashtra

This paper introduces an IoT-based Smart Home Gardening System aimed at efficient water management and optimised plant care. The system leverages advanced soil moisture, temperature, and environmental sensors to monitor conditions and dynamically adjust water distribution using a mobile application. This integration of IoT technology supports water conservation, healthier plant growth, and sustainable gardening practices. The study highlights its potential applications for indoor, outdoor, and urban gardening spaces, focusing on scalability, affordability, and user-friendly features.

Keywords: Smart Gardening, IoT, Water Conservation, Soil Moisture Sensors, Dynamic Irrigation, Mobile Application, Real-Time Monitoring, Environmental Sustainability.

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7 “What are the Odds?” Improving In-Game Win Probability Models in Football

Paper ID V11I5-1147 · Pages 59-62 · Mathematics

Arjun Bir Vashisht, Student, Woodstock School, Mussoorie, Uttarakhand

This paper explores the accuracy and usefulness of football win-probability models for analysts, clubs, and fans. Since football is a low-scoring and unpredictable game, probability models help us interpret uncertain outcomes and support strategies and decisions. The paper looks into Sam Green’s expected goals model and how it laid the foundation for future forecasting. It also evaluates how FiveThirtyEight’s and Herbinet’s models

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have expanded on this framework by integrating simulations, team strength ratings, and machine learning. By assessing the strengths and weaknesses of these three models, this paper identifies the most accurate approach for forecast match results.

Keywords: Win-Probability Models, Football Analytics, Expected Goals, Machine Learning, Spatio-Temporal, Sports Betting, FiveThirtyEight.

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8 A Study on the Dependence of Poverty on Crime: An Interdisciplinary Approach

Paper ID V11I5-1150 · Pages 63-69 · Economics

Aindri Basu, Student, Heritage Xperiential Learning School, Haryana

This paper examines the role played by various elements of socioeconomic status - economic, social, and psychological - in causing criminal behaviour to materialise. Firstly, isolated neighbourhoods often face disconnection from employment in the legitimate economy and encounter income inequality. For the poor, especially, the widening of the gap between the rich and them demonstrates the contrast between earnings from criminal activities and legitimate avenues. These communities often become spatially isolated, causing social mechanisms like collective efficacy and informal social control to break down due to a lack of trust among neighbours. In fact, high-crime urban areas share more or less similar neighbourhood characteristics in Brazil (Nogueira de Melo et al. 2017), China (Liu et al. 2016), South Africa (Breetzke 2010), and the United States (Tuttle 5). Coupled with the economic and social features, various intervening processes like parental discipline, supervision, and attachment factors play an equal role in developing an individual’s psyche. The need to appear “tough” to acquire status and to follow the “code of the streets” can create a mindset among people that can manifest into law-breaking activities. Through this paper, I shed light on the complexity involved in entering crime, and how it can sometimes equally be by circumstance, and not choice.

Keywords: Poverty, Crime, Society, Status, Economics.

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9 Optimising Emergency Vehicle Response Times with Genetic Algorithms: Integrating Routing and Traffic Signal Control

Paper ID V11I5-1151 · Pages 70-73 · Artificial Intelligence

Arjun Kulshreshtha, Student, Dhirubhai Ambani International School, Maharashtra

This paper explores the potential of genetic algorithms (GAs) in optimising emergency vehicle response times through both dynamic routing and adaptive traffic signal control. Traditional deterministic routing methods, such as Dijkstra’s and A*, fail to account for real-time traffic fluctuations or signal coordination, often leading to delays that reduce patient survival rates. A review of existing studies demonstrates that GAs outperform static algorithms by dynamically re-evaluating routes, optimising multi-stop journeys, and scaling to fleet-level management. Similarly, GAs have shown effectiveness in adjusting signal timings at intersections to minimise delays under fluctuating traffic volumes. However, most research addresses routing and signal optimisation

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separately, leaving a gap in integrated systems that combine both strategies. This paper highlights the need for GA-based frameworks capable of jointly coordinating emergency vehicle routing and signal pre-emption, tested on realistic urban networks. Such integration could significantly enhance emergency response efficiency and provide a scalable, adaptable solution for real-world applications.

Keywords: Genetic Algorithms, Emergency Vehicle Routing, Traffic Signal Optimisation, Dynamic Routing, Signal Pre-Emption, Urban Traffic Management, Real-Time Optimisation, Evolutionary Computation.

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10 Young Women and Social Media Feminism

Paper ID V11I5-1154 · Pages 74-77 · Media Studies

Pakhi Kshirsagar, Student, Suncity World School, Haryana

This paper examines whether feminism on social media, despite its empowering appearance, is truly inclusive and accessible to all sections of society, or primarily serves the interests of privileged users. Framed around the concept of 'epistemic injustice,' the study explores how digital platforms like Instagram and TikTok may unintentionally exclude marginalized voices through tools such as algorithmic sorting, aesthetic bias, and engagement-driven content filtering. Key concepts like testimonial injustice, shadowbanning, and report bombing are used to highlight the structural barriers faced by Dalit, queer, disabled, and muslim women online. By analyzing these platforms, the paper questions whether digital feminism truly reaches and democratizes voices or simply echoes dominant narratives.

Keywords: Social Media Feminism, Digital Feminism, Epistemic Injustice, Testimonial Injustice, Marginalized Voices, Instagram Feminism, Tiktok Feminism, Algorithmic Bias, Echo Chambers, Chaos Chambers, Feminism and Algorithms, Shadowbanning, Dalit Feminists, Logic of Virality, Content Moderation.

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11 India’s Digital Ladder: Who Can Climb?

Paper ID V11I5-1152 · Pages 78-82 · Information Technology

Navya Agarwal, Student, Mayoor School, Noida, New Delhi

There is an increasing spread of the internet in India. However, this spread is not evenly distributed. The marginalised communities have not gained the benefits and remain excluded due to low affordability, lack of digital literacy, language barriers, etc. Digital exclusion now affects people's ability to access government services, education, financial tools, and welfare schemes. As more things move online each day, being connected and able to use digital tools is becoming more important for everyday life. Those who lack access are being left out, which has created a wide economic and social gap in society. Unequal access to digital infrastructure and digital literacy leads the marginalised communities to feel even more alienated from the other sections of people who do have access to these resources. It does not create an equitable growth in the economy, as these people do not get equal advantages from the economic and social opportunities offered due to a lack of education, personal biases, lack of funds for infrastructure, etc. Various scholars and reports have studied rural-urban gaps and how digital exclusion affects their social status. This paper is a shift from

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educational insights to actual economic consequences of the digital divide. My research will identify who is facing these problems and is left behind, and the causes that are leading to this exclusion. This research paper is derived from secondary data from reports, other papers and scholarly articles. It does not include primary fieldwork but instead compiles data from different sources like ITU, Oxfam, NITI Aayog, etc.

Keywords: Digital Divide, Digital Literacy, Rural India, Economic Inequality, Gender Gap, E-Governance, Financial Exclusion, Digital Inclusion.

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12 Mental Health Awareness of Teenagers in India

Paper ID V11I5-1155 · Pages 83-86 · Psychology

Aanya Nanda, Student, Shikshantar School, Haryana

This research paper looks at the mental health issues faced by teenagers in India. It addresses the key challenges faced by teenagers, such as academic pressures, social pressures and the different ways of improving them. It talks about the ever-present concerns during the teenage years, such as competitive examinations, beauty standards, peer pressure, bullying and body image issues. The paper also assesses current support networks like iCALL and Tele MANAS and various school-based programs and comments on their efficacy. Through the examination of school-based programs and pressures faced by students, the research aims to increase awareness surrounding the mental health of students and the different ways of improving it.

Keywords: Mental Health, Teenagers, Competitive Examinations, Beauty Standards, Body Image, Student Suicide, Academic Pressure, JEE, NEET.

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13 Endemic Life on the Indian Plate

Paper ID V11I5-1148 · Pages 87-89 · Geology

Shouryasiraj Krishnakoli Subramaniam, Student, JBCN Parel, Mumbai, Maharashtra

This paper explores the evolutionary trajectory of Mesozoic terrestrial vertebrates on the Indian Plate during its prolonged geographic isolation following the breakup of Gondwana. Spanning from the Early Cretaceous to the Paleogene, the study analyzes how India's tectonic drift across the Tethys Ocean facilitated the development of endemic clades, including abelisaurid theropods, basal lepidosaurs, and gondwanatherian mammals. The paper is structured across two major themes: (1) the tectonic and paleogeographic history of the Indian Plate’s separation from Gondwana; (2) the distinct evolutionary patterns in endemic vertebrate faunas shaped by this.

Keywords: Mesozoic Terrestrial Vertebrates, India Plate, Endemic Clades, Gondwanan Biogeography, Abelisaurid Dinosaurs, Gondwanatherians.

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14 A Theoretical Explanation on Neural Regeneration and the Science Behind the Brain's Refusal to Heal

Paper ID V11I5-1158 · Pages 90-92 · Biology

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The Animal Kingdom consists of a variety of organisms that each have a unique regeneration process for organs and the function of the body. For instance, among vertebrates, the capacity of brain regeneration works on a whole new level than it does for mammals. An example of this vertebrate includes a Zebrafish, a teleost with a relatively simple neural system and structure, that can regenerate an extensive amount of its brain regions even after injury, including areas that are analogous to the mammalian forebrain. – In neuroscience, it is common to compare the analogous brain structures across different classes; so even though vertebrates and mammals are two different classes, the analogous forebrain regions may share development pathways. The neural stem cells multiply, damaged circuits are regenerated or reformed, and behavioural functions can possibly be restored. In contrast to this phenomenon, when an adult human brain is injured, suffers trauma or undergoes a stroke, it responds by protecting the damaged brain area by inflammation, gliosis or isolation, forming scar tissues, rather than processing regeneration – due to this, new neurotic signals are not formed, the broken connections between the damaged neurones are not repaired and the lost brain function is generally permanent. Additionally, even though the human brain is incapable of regenerating itself after injury, the genetic instructions needed to build brain tissues are still present in our DNA. This could mean that the ability of the brain to repair itself is not entirely missing – instead, the gene may be turned off or tightly controlled. When this process of regeneration is compared with species that are capable of doing this, it is evident that regeneration does not primarily focus upon having the right genes, but it is about how these genes are regulated in each species. In this paper, we explore the possibility of how the human brain may be deliberately limiting its own healing ability. This could be looked at as a protective strategy rather than a flaw, a strategy that aims to preserve complex functions – like memory, personality, and consciousness.

Keywords: Brain Regeneration, Central Nervous System, Glial Scarring, Hippocampus, Identity, Neural Progenitor Cells, Non-Neurogenic Zone, Subventricular Region.

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15 How Technologies are Negatively Influencing the New Generation's Behaviour, Work Ethic, and Thinking Skills

Paper ID V11I5-1153 · Pages 93-96 · Information Technology

Daksh Shevakramani, Student, Heriott-Watt University, Dubai

This paper examines how modern technologies—including smartphones, social media, and artificial intelligence tools—are reshaping the behaviour, work ethic, and thinking skills of the younger generation. It argues that increasing dependence on AI is weakening critical thinking, while the addictive nature of social media fosters anxiety, unrealistic comparisons, and shortened attention spans. Additionally, the growing obsession with quick success and online fame is replacing discipline, patience, and long-term goal setting with a culture of instant gratification. Ethical concerns are also explored, particularly regarding harmful content exposure and algorithm-driven engagement that disregards age appropriateness. The paper concludes that while technology offers

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opportunities, its unchecked influence risks producing a generation less resilient, less creative, and more dependent on external systems. It emphasises the urgent need for education, parental guidance, and stricter regulation to ensure healthier digital habits and safeguard the future of young people.

Keywords: Technology and Youth, AI Dependence, Social Media Influence, Critical Thinking, Instant Gratification, Work Ethic, Digital Addiction, Mental Health, Algorithm Ethics, Online Content Exposure.

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16 From Concept to Creation: Prototyping A Centrifugal Projectile Launcher and Analyzing Its Performance

Paper ID V11I5-1159 · Pages 97-101 · Mechanical Engineering

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This study presents the design, prototype, and performance analysis of a centrifugal projectile launcher. The research encompasses the conceptual design, key components, and manufacturing processes involved in creating the launcher. The design considerations include material selection, structural integrity, aerodynamics, and precision. The manufacturing process details the fabrication of the rotating arm, integration of the motor and power source, development of the projectile release mechanism, and implementation of safety features. Extensive testing was conducted to evaluate the launcher's performance, analysing parameters such as rotation speed, projectile shape and other characteristics. The results provide insights into its launch velocity, revolutions per minute, precision, and energy efficiency. The study also explores potential future applications and improvements, including advanced materials, automated systems, and scaling possibilities. This research contributes to the understanding of centrifugal projectile launchers and their potential applications in scientific research, sports, and industry.

Keywords: Centrifugal Projectile Launcher, Projectile Dynamics, Mechanical Design, Experimental Prototyping, Performance Analysis, Energy Efficiency, Rotational Mechanics, Launch Velocity, Trajectory Analysis, Ballistics, Applied Mechanics, Material Selection, Safety Features, Automation, Scientific Applications, Sports Technology, Industrial Applications.

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17 What are the Economic Implications of Congestion Pricing on Urban Traffic Management?

Paper ID V11I5-1157 · Pages 102-105 · Economics

Shaurya Vikas Agarwal, Student, Victorious Kidss Educares, Maharashtra

Urban congestion poses significant economic, social, and environmental challenges, from wasted fuel and time losses to deteriorating air quality. Congestion pricing has emerged as a policy tool to address these negative externalities by charging vehicles for road use in high-demand areas. This paper examines the economic implications of congestion pricing through both theoretical foundations and case studies from London, Stockholm, and Singapore, while also considering its potential in India. Findings show that congestion pricing reduces traffic volumes, increases travel speeds, and generates substantial revenues that can be reinvested into public transportation and sustainable infrastructure. However, its effectiveness depends heavily on

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equitable policy design, with exemptions, subsidies, and transparent reinvestment strategies playing a key role in public acceptance. The analysis concludes that while congestion pricing is not a standalone solution, it can serve as a cornerstone of sustainable urban mobility when integrated with broader strategies for equity, technological innovation, and inclusive growth.

Keywords: Congestion Pricing, Urban Mobility, Traffic Management, Economic Efficiency, Equity, Pigouvian Taxation, Externalities, Sustainable Transport, London, Stockholm, Singapore, India, Public Transportation, Environmental Policy.

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18 Analysing Gender Bias in Job Descriptions Using Machine Learning and NLP Techniques

Paper ID V11I5-1163 · Pages 106-110 · Machine Learning

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The growing use of automated recruitment systems has raised concerns about gender bias in job descriptions. Subtle linguistic cues can discourage qualified candidates from underrepresented groups, reinforcing workplace inequality. This study presents a computational framework using Natural Language Processing (NLP) and Machine Learning (ML) to detect and analyse such bias. The methodology involves text preprocessing, gender-coded word scoring, topic modelling with Latent Dirichlet Allocation (LDA), clustering via KMeans, and visualisation through t-SNE. A curated lexicon of masculine- and feminine-coded words assigns bias scores, while topic modelling uncovers latent themes in postings. Clustering groups of semantically similar descriptions enables analysis of bias distributions across occupational categories. Findings show that bias varies by job type: technical and managerial roles tend to use more masculine-coded language, while service and support roles favour feminine-coded terms. Semantic cluster visualisations confirm systemic patterns in word usage. This research underscores the need for fairness-aware audits in recruitment, offering both theoretical and practical insights into bias detection. The framework provides organisations with a scalable tool to identify and mitigate hidden biases, promoting inclusive hiring practices and supporting compliance with ethical and regulatory standards.

Keywords: Gender Bias, Job Descriptions, Fair Recruitment, Natural Language Processing (NLP), Machine Learning, Topic Modelling, Algorithmic Fairness.

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19 IPO Timing and Market Readiness: An Interdisciplinary Review of Strategic Entry Points

Paper ID V11I5-1169 · Pages 111-115 · Finance

Aaryan Rahul Sethi, Student, New Delhi Institute of Management, New Delhi

This study provides an interdisciplinary examination of the determinants of Initial Public Offering (IPO) timing and market readiness. Integrating perspectives from economics, financial consultancy, trading practice, and entrepreneurial decision-making, the analysis demonstrates that IPO performance is contingent upon both external market conditions and internal organisational preparedness. Economists underscore the influence of

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macroeconomic cycles, venture capital flows, and volatility indices in shaping IPO windows. Financial consultants emphasise the critical role of governance structures, financial integrity, and operational discipline in sustaining post-listing stability. Traders, in contrast, interpret IPOs primarily as events of liquidity and sentiment-driven volatility, privileging short-term momentum indicators over fundamentals. Business leaders conceptualise IPOs as transformative junctures, motivated by capital sufficiency, investor dynamics, and founder psychology. The study concludes that successful IPOs emerge not from opportunistic timing alone but from the alignment of external conditions with institutional resilience, governance capacity, and long-term strategic vision.

Keywords: Initial Public Offering (IPO), Market Readiness, IPO Timing, Governance, Compliance, Investor Sentiment, Trader Behavior, Founder Psychology, Macroeconomic Indicators.

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20 Ancient Indian Scripture Based Retrieval-Augmented Systems: A Comprehensive Analysis

Paper ID V11I5-1176 · Pages 116-121 · Natural Language Processing

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This paper focuses on the development and systematic comparison of Retrieval-Augmented Generation (RAG) systems, retrieval-only systems and LLM models all trained on ancient Sanskrit Scriptures. This was done in order to analyse whether RAG systems improved faithfulness in answers to reflective questions, by storing two pertinent Sanskrit scriptures: the Itihasa (including the Mahabharata and Ramayana) and the Bhagavad Gita in a FAISS index, I developed the following: a basic retrieval system from the FAISS index, a prebuilt LLM model (Qwen 2.5-3B-Instruct), an RAG system with the LLM model Qwen 2.5-3B-Instruct and an RAG system with Gemini 2.5 Flash. After development, I evaluated the four models on a list of twenty questions pertaining to philosophy, interpersonal and intrapersonal understanding, and emotional well-being. I ranked each answer on a scale from 1 to 5 on relevance, helpfulness, clarity and faithfulness. All retrieval and RAG models scored a perfect 5 in the ‘faithfulness’ metric in contrast to the base LLM model, which scored a 4.3. Moreover, I discovered that the use of a weaker LLM model in an RAG system can lead to worse results in the ‘helpfulness’ and ‘clarity’ metrics when compared to a regular LLM model when the retrieved verses are low. Through the methods and results of my research, I showed that RAG systems are necessary to provide specific and faithful answers from ancient Sanskrit philosophy.

Keywords: Large Language Models, Retrieval-Augmented Generation (RAG), Embeddings, FAISS, Qwen 2.5-3B-Instruct, Gemini 2.5 Flash.

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21 Intrusion Detection in AWS Cloud Environments Using Machine Learning on Network Flow Data

Paper ID V11I5-1145 · Pages 122-134 · Cloud Computing

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AWS Cloud Environments support core workloads and services, but are exposed to malicious actions and unauthorized activities in the transmission of network flow data. The threats subject cloud infrastructures to different types of attacks, thus Intrusion Detection in AWS Cloud Environments ensures privacy, reliability, and availability. This study explores the use of Machine Learning for intrusion detection by analyzing traffic patterns in cloud systems. The CSE-CIC-IDS2018 dataset, containing realistic benign and attack traffic, was employed for model training and evaluation. After comprehensive preprocessing and analysis, five Machine Learning algorithms were implemented: Random Forest, Decision Tree, Ridge Classifier, Logistic Regression, and Linear Support Vector Classifier. Their performance was measured using accuracy, precision, recall, F1 score, ROC-AUC, and detection time. Results showed that Random Forest and Decision Tree achieved the highest accuracy at 100%, with the Decision Tree demonstrating superior efficiency by classifying all instances in 0.056 seconds. Ridge Classifier followed with an accuracy of 99.2%, while Logistic Regression achieved 98.8%. The Linear Support Vector Classifier recorded the lowest performance with 96.2% accuracy. This research confirms the effectiveness of Machine Learning for cloud security. The Decision Tree Classifier, combining flawless accuracy with the fastest detection speed, emerges as the most practical model for real-time intrusion detection in AWS environments.

Keywords: Cloud, IDS, FlowData, Machine Learning, AWS, Intrusion and Detection, Cyber-Attack.

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22 The Case of Declining Rental Properties All Over the World: A Global Perspective; Renting vs Buying

Paper ID V11I5-1186 · Pages 135-140 · Finance

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This paper tries to examine the factors that influence the choice of housing tenure for individuals across the globe. Factors such as demographics, social, economic and policy perspectives all play a key role in shaping the choice of tenure for those individuals. The choice is dependent on other factors like the age, household structure, price-to-income and price-to-rent ratios of the person, housing allowances and other such key factors. This paper also takes into consideration which choice is more prevalent in different countries and the reason behind it. It also takes into consideration factors such as the level of urbanisation and migration present in the country, as well as the societal and cultural norms of the country. Global Comparisons show that there are many differences in the choice of tenure, with developed economies showing vast differences between the amount of renters and owners, while developing economies like India face many challenges, including affordability problems, a high number of empty houses and uneven distribution between the number of renters and owners. This paper also takes into account the role of the government and their policies pertaining to taxes

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and incentives, reduction in interest on mortgages and home loans, as well as fewer taxes for homeowners promote homeownership, while poor and strict rules and regulations often make renting a more inefficient choice and have a major impact on the housing market for renters. Historical trends of housing taken from 2 decades, 2005-2015, 2015-2025, indicate changing patterns in the choice of tenure by individuals influenced by various key factors such as increasing prices and interest rates, higher inflation and fluctuations in the housing market have caused a difference in the choice of tenure. This paper also tries to examine the price-to-rent ratios and their impact on housing, along with the impact of interest rates, showing how these key factors can shift a person's choice from owning to renting or vice versa. Lastly, the paper analyses long-term sustainability and future outlooks for the housing tenures, highlighting the importance of policies as well as paying attention to the problems related to housing, such as vacancy and enhancing the understanding of the choice of consumers across the globe to figure out what tenure choice is most suitable for the future, with reference to their countries.

Keywords: Housing, Tenure, Rent, Rental, Market, Countries, Household, Affordability, Homeownership, Rentership, Real Estate, Economics, Price-To-Rent Ratio, Income, Sustainability, India Rental Market, Residential Real Estate.

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23 Libraries of Chandannagar: A Cultural Study with Special Reference to Akshar Bandhu Granthaghar

Paper ID V11I5-1175 · Pages 141-147 · Libraries Of Chandannagar A Cultural Study

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Chandannagar — a town with deep colonial and cultural roots — hosts a constellation of libraries that have historically mediated knowledge, memory, and everyday cultural practices. This paper analyses the evolving social roles of Chandannagar’s libraries with special reference to Akshar Bandhu Granthaghar (est. 2025). Using archival study, field observation, and semi-structured interviews with library users and staff across seven representative institutions (Akshar Bandhu Granthaghar; Chandannagar Pustakagar; Institute de Chandannagore; Chandannagar College Library; Chandannagar Museum Library; Gondalpara Sammelan Town Library; and selected parish/town libraries), we examine how mission, physical presentation (including cover-based selection), oral practices (storytelling, recitation), memory work, and nature-based reading activities contribute to inclusive reading cultures. Findings identify (1) a shift from elitist/academic library functions to community-embedded, democratic reading practices; (2) Akshar Bandhu’s explicit mission to facilitate book-familiarity among marginal groups through cover-driven selection and oral dialogic methods; and (3) hybrid practices that blend archival memory with living oral traditions. The study argues that community-centred

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libraries like Akshar Bandhu serve as models for democratizing reading and proposes policy and programming recommendations for sustaining such inclusive library ecosystems. The manuscript is prepared to meet international journal standards in Library & Information Science / Cultural Studies.

Keywords: Chandannagar, Public Libraries, Akshar Bandhu Granthaghar, Reading Culture, Marginal Communities, Oral Tradition, Cultural Memory.

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24 Fortifying AI Infrastructure: Securing Code, Configuration, and Integrity in National Systems

Paper ID V11I5-1190 · Pages 148-157 · Computer Science

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The rapid adoption of artificial intelligence (AI) on cloud platforms, such as AWS and Azure, has introduced critical security vulnerabilities across various national sectors, including defense, healthcare, and energy. While these environments deliver scalable intelligence, they also expand the attack surface, exposing misconfigured resources, unverified code, and weak identity controls. Recent breaches, including Capital One's AWS data exposure, Tesla's compromised Kubernetes console, and Microsoft's AI dataset leak, demonstrate how cloud-hosted AI pipelines can be weaponized through insecure defaults, leaked credentials, and permissive access roles. This study analyzes prominent security incidents alongside current research on cloud and AI threats to identify recurring weaknesses in configuration management, secret handling, and model integrity. The findings highlight how attackers exploit these gaps to steal data, engage in cryptojacking, and gain unauthorized access to AI models. To address these risks, the paper proposes a framework for fortifying AI infrastructure that emphasizes: (1) zero-trust identity and access management, (2) secure coding and model lifecycle practices, (3) automated configuration scanning, and (4) continuous policy enforcement. The results underscore that AI infrastructure should be treated as national critical infrastructure, warranting rigorous standards and proactive defense measures. Without systematic hardening, AI pipelines are high-value targets for cybercriminals and nation-state actors, posing a threat to public safety and national security.

Keywords: AI Infrastructure, Cloud Security, Infrastructure as Code (IaC) Security, Code and Data Integrity, National Cybersecurity.

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25 Automated Brain Tumor Segmentation Using a UNet3D-Based Deep Learning Model

Paper ID V11I5-1178 · Pages 158-164 · Computational Medicine

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A crucial task in medical imaging is brain tumor segmentation, which allows for accurate diagnosis and treatment planning for patients with brain tumors. Magnetic Resonance Imaging (MRI) provides detailed volumetric data, but manual segmentation is time-consuming and prone to variability. Deep learning,

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particularly convolutional neural networks such as UNet3D, has emerged as a powerful tool for automating and enhancing segmentation accuracy. Accurate and efficient segmentation of brain tumors from multi-modal MRI scans remains challenging due to the heterogeneity of tumor appearances, varying MRI modalities (e.g., T1, FLAIR), and the need for robust models that generalize across diverse datasets. This study aims to develop and evaluate a UNet3D-based deep learning model for automated brain tumor segmentation, leveraging the BraTS2020 dataset to achieve high-precision delineation of tumor regions in MRI scans. We developed and trained a UNet3D-based model tailored for brain tumor segmentation, utilizing PyTorch and nibabel to process 3D MRI data from the BraTS2020 dataset. The model was comprehensively evaluated on standard datasets, demonstrating robust performance across multiple MRI modalities. We conducted a thorough comparison with baseline segmentation techniques, including traditional methods and other deep learning approaches, analyzing metrics such as Dice scores and segmentation accuracy. Our results highlight the model's superior ability to delineate tumor boundaries, offering improved precision and efficiency over baselines, thus advancing the application of artificial intelligence in medical imaging for brain tumor diagnosis.

Keywords: Brain Tumor Segmentation, UNet3D, Deep Learning, Magnetic Resonance Imaging (MRI), BraTS2020 Dataset, Medical Imaging, Artificial Intelligence, Tumor Delineation, Multi-Modal MRI, Dice Similarity Coefficient.

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26 The Integration of AI in Cybersecurity

Paper ID V11I5-1187 · Pages 165-169 · Artificial Intelligence

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This paper examines the integration of AI in cybersecurity, highlighting its implications for everyday life and its role in preventing cyberattacks. It analyses key protective measures, including SIEM and SOAR, and evaluates the emerging field of Agentic AI as both a potential solution and a risk. Finally, it explores the relationship between AI, IT, and IOT, emphasising AI's capacity to advance technological progress while simultaneously expanding potential vulnerabilities.

Keywords: AI Cybersecurity, SIEM, SOAR, Agentic AI Cybercrime.

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27 A Detailed Analysis of Biosensors Used to Combat Antibiotic Resistance

Paper ID V11I5-1174 · Pages 170-175 · Medicine

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Antibiotic resistance presents a global health crisis, where bacteria evolve to withstand antimicrobial treatments, increasing mortality rates. This escalating threat, even though a natural evolutionary process, has been significantly accelerated by the pervasive misuse and overuse of antibiotics in both human and veterinary medicine. The staggering statistics, including millions of infections and thousands of deaths annually in the United States alone, underscore the urgent need for innovative solutions. Among the most promising advancements are biosensors, analytical devices comprising a biorecognition element and a transducer. These instruments offer rapid, sensitive, and precise detection of pathogens and antibiotic residues. Various

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biosensors are being developed and deployed to identify resistant microbial strains. Biosensors are a pivotal tool in mitigating the deadly impact of antimicrobial resistance and safeguarding public health.

Keywords: Antibiotic Resistance, Global Health Crisis, Biosensors, Pathogen Detection, Antimicrobial Misuse.

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28 AI in Healthcare- A Global Perspective

Paper ID V11I5-1198 · Pages 176-185 · Economics And Business

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Despite their initial seeming incompatibility, research shows that AI and conventional medicine may work effectively together. 'Mapping the use of artificial intelligence in traditional medicine' is a new brief from the World Health Organization (WHO) and its partners that demonstrates how AI may support TCIM (traditional, complementary, and integrative medicine) while preserving cultural heritage. By raising the standard of patient care, artificial intelligence (AI) is predicted to enhance long-term health outcomes. AI makes it possible for extremely accurate diagnoses, individualized treatment plans, quicker recovery times, and fewer problems by rapidly and correctly analyzing patient data. In addition to helping patients, these advancements lower the expenses associated with incorrect diagnoses and inefficient therapies. AI is useful in public health management. It can alleviate the strain on healthcare systems by forecasting health trends and enhancing outcomes for entire populations. By providing more individualized and affordable services, increasing patient alternatives, and promoting better treatment, AI strengthens competition.

Keywords: AI (Artificial Intelligence), Data Scientists, Healthcare, Data Privacy, Ethics, Digital Tools, Virtual Patients, Economic Implications, Personalization, Route Optimization, Automation, Chatbot, Cybersecurity, Predictive Maintenance, Data Analytics, Machine Learning, Preventive Care, Transformer, Neural Networks, Autonomous.

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29 Explainable Deep Learning for Satellite-Based Natural Disaster Detection and Prediction

Paper ID V11I5-1202 · Pages 186-189 · Artificial Intelligence

Hruday Shreyas Rachapudi, Research Scholar, Milpitas High School, California

Over Earth’s 4.54 billion-year history, natural disasters have reshaped its topography countless times. Earthquakes, storms, floods, and droughts are among the most destructive and unpredictable natural disasters. However, satellite data combined with machine learning algorithms now offer new ways to detect early warning signs of these disasters and mitigate their effects. By leveraging Geographic Information System (GIS) data, NASA’s Global Precipitation Measurement (GPM), and other satellite technologies, researchers can analyze massive geospatial datasets to identify subtle patterns imperceptible to humans. This paper explores the role of machine learning and satellite data in predicting natural disasters. It highlights the technological advancements that could significantly reduce the human and environmental toll of these events.

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Keywords: GIS(Geographic Information Systems), GPM(Global Precipitation Measurement), JAXA(Japan AerospaceExploration Agency), DPR(Dual Frequency-Precipitation Radar), GMI(GPM Microwave Imager).

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30 IOT-Based Drainage Block Detection with Control-Based Drainage Unit Cleaner

Paper ID V11I5-1203 · Pages 190-193 · Internet Of Things(iot)

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This Paper presents an IoT-based drainage block detection and cleaning system designed to address frequent drainage blockages that cause waterlogging, foul odors, and health risks. The system uses sensors such as ultrasonic, flow, and gas detectors to monitor water levels and detect blockages in real time. Data is transmitted to a control room dashboard via IoT modules (ESP8266/ESP32), where alerts are generated when abnormal conditions occur. A mechanized cleaning unit, controlled remotely from the control room, removes solid waste using motorized arms or brushes, reducing manual intervention and ensuring worker safety. The proposed system provides an efficient, low-cost, and smart solution for real-time monitoring and automated drainage maintenance, contributing to safer and cleaner urban environments.

Keywords: IoT, Drainage Block Detection, Control Room, Ultrasonic Sensor, Automated Cleaning, Smart Cities.

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31 QiML Framework for Anomaly Detection in NFV-Clouds

Paper ID V11I5-1206 · Pages 194-201 · Cyber Security

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Network Function Virtualization (NFV) transforms traditional network infrastructures by replacing hardware components with software-based Virtual Network Functions (VNFs). While NFV improves flexibility, scalability, and cost efficiency, it also introduces significant cybersecurity challenges due to vulnerabilities in virtualization layers, orchestration tools, and multi-tenant environments. Conventional intrusion detection systems and classical machine learning (ML) models such as Support Vector Machines, Random Forests, and traditional neural networks often fail to cope with evolving threats, leading to high false positives, computational overhead, and limited effectiveness against zero-day attacks. To address these limitations, this paper proposes a Quantum-Inspired Machine Learning (QiML) framework specifically designed for anomaly detection in NFV-cloud security. The framework integrates multiple modules: Quantum-inspired Feature Encoding (QiFE) for compact data representation, a Quantum-inspired Evolutionary Algorithm (QiEA) for feature selection, Quantum-inspired Neural Networks (QiNN) for accurate anomaly detection, an Adaptive Quantum-Inspired Cybersecurity Strategy for real-time mitigation, and Quantum-inspired Explainable AI (QiXAI) for interpretability. Experimental

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evaluations using CIC-IDS2018, UNSW-NB15, and NFV-specific synthetic datasets demonstrate the superior performance of the proposed framework. The QiEA + QiNN model achieved an accuracy of 98.20%, precision of 97.70%, recall of 97.40%, and F1-score of 97.55% on CIC-IDS2018, outperforming classical ML baselines. Furthermore, the framework reduced feature dimensionality and training time, enhancing efficiency for real-world NFV-cloud deployments. Overall, the QiML framework demonstrates strong potential for advancing secure, adaptive, and interpretable anomaly detection in NFV-cloud environments.

Keywords: Network Function Virtualization, Quantum-Inspired Machine Learning, Anomaly Detection, Cybersecurity, Explainable AI.

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32 Text Mining and Sentiment Analysis of Major Religious and Philosophical Texts- Applying Natural Language Processing to Uncover Linguistic Patterns, Thematic Elements, and Emotional Tone

Paper ID V11I5-1205 · Pages 202-204 · Psychology

Sohan Sai Yerragunta, Student, Rouse High School, Leander, Texas

This research uses natural language processing (NLP) methodologies to quantitatively analyze key religious and philosophical texts by identifying language trends, themes, and sentiment. Using a combination of text-mining techniques, topic modeling, and sentiment/emotion analysis, we evaluate how ideas, values, and emotions are conveyed within religious and philosophical traditions, including the Bible, Quran, Bhagavad Gita, and classic philosophy texts. The research analyzes publicly available text corpora and translations to quantify word counts, identify topic trends, and analyze emotional trajectories across chapters and verses. The comparative analysis reveals differences in thematic focus, emotional tone, and rhetorical style across religious and philosophical texts, and across translations of the same texts. The study's aim is to show the efficacy of computational methods as a complement to traditional textual scholarship by developing new ways to analyze form, sentiment, and meaning of primary texts. The interdisciplinary study and research also aim to contribute to emerging dialogue between the fields of digital humanities, linguistics, and religious studies to provide frameworks for large-scale, digital, and data-based analysis of sacred texts and literature.

Keywords: Natural Language Processing (NLP), Text Mining, Sentiment Analysis, Topic Modeling, Religious Texts, Philosophical Texts, Digital Humanities, Linguistic Patterns, Emotional Tone, Thematic Analysis, Sacred Scriptures, Comparative Textual Analysis, Computational Text Analysis, Bible, Quran, Bhagavad Gita, Classical Philosophy, Transformer Models, Latent Dirichlet Allocation (LDA), Emotion Detection, Data-Driven Hermeneutics, Textual Scholarship, Interdisciplinary Research.

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33 Margins and Gateways: The Economic Struggles of Emerging Fine Artists in India’s Contemporary Art Landscape

Paper ID V11I5-1209 · Pages 205-209 · Economics

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This paper examines the key challenges faced by emerging artists in India, including limited access to markets, professional networks, and financial stability. It explores how gatekeeping in galleries, intense competition for exposure, and the scarcity of grants and patrons restrict opportunities for new talent. The instability of freelance and teaching work further compounds these difficulties. Through analysis of current conditions and available support systems, the paper highlights the need for more inclusive, transparent, and decentralized frameworks to support emerging artists and ensure a more equitable future for India’s creative community.

Keywords: Emerging Artists, Art Market Access, Financial Instability, Exposure Opportunities, Grants and Residencies.

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34 Detecting Money Laundering through Artificial Intelligence: A Commercial and Predictive Perspective

Paper ID V11I5-1212 · Pages 210-220 · Ai

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Money laundering—the concealment and integration of illicit proceeds into the formal financial system—undermines the trust and fairness of global financial systems, presenting enormous challenges to investors, regulators, and commercial enterprises. Traditional detection methods based on rigid rule-based systems and manual auditing have proven insufficient in combating increasingly sophisticated laundering schemes. This paper demonstrates how data science, commercial domain knowledge, and machine learning—specifically, decision tree models—can be synthesized to enhance real-time detection of suspicious financial activities. Through a comprehensive workflow involving synthetic transaction data generation, exploratory data analysis, and predictive modeling, critical patterns such as transaction amount, timing, customer risk profiles, and transaction type emerge as powerful indicators of money laundering behavior. Bar diagrams and visual analytics visually support the findings, illustrating feature importance rankings and identifying high-risk transaction segments. The commercial impact of this approach includes proactive regulatory compliance, significant workload reduction for compliance analysts, and minimal customer friction through reduced false positives. This research highlights how student-level expertise combined with interpretable AI tools can effectively bridge the gap between traditional commerce education and modern financial technology compliance solutions. The decision tree model achieved 99.93% testing accuracy with a precision and recall of 99.82% each, demonstrating the viability of automated AML detection systems in real-world banking environments.

Keywords: Anti-Money Laundering, Artificial Intelligence, Machine Learning, RegTech, Financial Crime Detection, Compliance Automation, Transaction Monitoring, Fintech.

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35 An AI-Based Framework for Early Cancer Detection Using Machine Learning Technique

Paper ID V11I5-1214 · Pages 221-228 · Ai

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Cancer detection using machine learning has emerged as a promising approach for improving early diagnosis and patient outcomes. This research focuses on applying advanced algorithms such as Convolutional Neural Networks (CNN), Support Vector Machines (SVM), and ensemble models to analyze medical imaging and histopathological data. The system automates feature extraction and classification, enhancing diagnostic accuracy and reducing human error. Data from breast, lung, and oral cancer datasets were used for model training and validation. Preprocessing techniques were applied to ensure image clarity and consistency. The proposed model achieved high precision and recall in identifying cancerous patterns. Limitations include data imbalance and interpretability challenges. Future work aims to integrate real-time diagnostics and multi-modal data for broader clinical use.

Keywords: Cancer Detection, Machine Learning, Deep Learning, CNN, SVM, Medical Imaging, Early Diagnosis, AI in Healthcare.

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36 Intellectual Property Rights and Competition Law: A Critical Analysis

Paper ID V11I5-1210 · Pages 229-233 · Law

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This research paper examines the complex interface between Intellectual Property Rights (IPR) and Competition Law, analyzing the delicate balance between promoting innovation through temporary monopolies and preventing anti-competitive practices that harm consumer welfare. The study critically evaluates the legal framework governing this interface in India, primarily through Section 3(5) of the Competition Act, 2002, and examines landmark judicial precedents that have shaped the jurisprudence in this domain. Through comparative analysis of international approaches and examination of contemporary challenges, this paper argues that while IPR and competition law serve complementary objectives of promoting innovation and consumer welfare, their intersection requires careful judicial and regulatory navigation to prevent abuse of monopoly power while preserving incentives for innovation. Through a comprehensive examination of case law, statutory frameworks, and emerging trends in digital markets, this paper argues that a balanced approach is essential to foster innovation while maintaining competitive markets. The analysis includes recent developments in the technology sector antitrust enforcement, particularly focusing on major cases involving Google, Apple, Microsoft, and other tech giants that illustrate the contemporary challenges at this legal intersection.

Keywords: Intellectual Property Rights, Competition Law, Antitrust Innovation Policy, Market Competition, Digital Markets.

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37 Factors Considered while Choosing a Life Insurance Company

Paper ID V11I5-1235 · Pages 234-240 · Finance

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This paper evaluates the factors considered for the selection of a Life Insurance Company by individuals. Life Insurance is an important part of one's life, which gives security to the family of that individual future security in the absence of that individual. Many people take a policy on the recommendation of friends or family members, which can prove wrong as that individual doesn't consider the important factors related to the policy, its terms and conditions, etc. So, it is important to consider the factors related to a life insurance company, like the Claim Settlement Ratio of the company, Solvency Margins, Reputation, etc. Therefore, this paper evaluates the behaviour of consumers while selecting a company by way of a survey with a structured questionnaire where people are asked about their choices about a company. The research focuses more on the salaried people, who were the samples for this survey, as they are primarily responsible for protection themselves and their families. The main objective of this research is to check the knowledge of people about different terms associated with life insurance, as well as the importance of these terms, while selecting a life Insurance Company.

Keywords: Life Insurance, Claim Settlement Ratio, Reputation, Selection, Security, Benefits.

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38 Forecasting Stock Market Prices Using Long Short-Term Memory (LSTM)

Paper ID V11I5-1227 · Pages 241-247 · Finance And Artificial Intelligence

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This study applies a Long Short-Term Memory (LSTM) neural network to forecast stock closing prices for selected technology companies (Apple, Google, Microsoft, and Amazon). The paper documents data collection, preprocessing, exploratory analysis (returns, volume, correlations), model architecture, and results. The aim is to evaluate LSTM's ability to capture temporal patterns in stock prices and to provide practical insights for short-term forecasting. Key findings show that the LSTM model captures overall price trends and produces reasonable short-horizon forecasts; however, prediction accuracy is affected by market volatility, data noise, and model complexity.

Keywords: Stock Market Prediction, Long Short-Term Memory, LSTM, Deep Learning, Neural Networks, Time Series Forecasting, Financial Analytics, Machine Learning, Price Prediction.

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39 Hybrid Logistic Regression and Random Forest Model for Diabetes Prediction Using Feature Elimination

Paper ID V11I5-1242 · Pages 248-254 · Science And Technology

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The most common chronic diseases, diabetes mellitus, affect millions of people annually throughout the world. In order to lower the long-term health risk of diabetes, such as heart disease, kidney failure, and nerve damage, early detection and management are essential. The order to predict the risk of diabetes uses actual clinical data; this study presents a hybrid model that combines the Random Forest (RF) and Logistic Regression (LR) algorithms. Increase accuracy and interpretability, model also use Recursive Feature Elimination (RFE) to identify the most significant predictive features.PIMA Indian Diabetes dataset, along with World Health Organization (WHO) global health data, was used to train and validate the suggested model. The hybrid LR–RF approach obtained an accuracy of 89.2%, based on the findings and outperformed the individual model with a ROC-AUC score of 0.91. This model method shows how data-driven and interpretable artificial intelligence can help with clinical decision-making and provide patients and healthcare providers with trustworthy diagnostic tools.

Keywords: Machine Learning, Z-Index, Mean Square Error, Outlier Handling, Accuracy, Precision, Recall, F1-Score, WHO (World Health Organization), PIMA Dataset.

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40 Access to Microcredit and Its Impact on Women Entrepreneurs in Rural India

Paper ID V11I5-1250 · Pages 255-257 · Entrepreneurship

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This research paper investigates how microcredit access has transformed women’s entrepreneurial landscapes in rural India. Microcredit programs, often implemented through Self-Help Groups (SHGs) and microfinance institutions, have been instrumental in enhancing financial inclusion, promoting entrepreneurship, and empowering women socially and economically. The study assesses how access to small loans helps women develop enterprises, increase income, and gain greater control over family decisions. Using a mixed-method research design, the paper combines quantitative data from 100 rural entrepreneurs with qualitative interviews highlighting personal success stories and challenges. The results demonstrate a positive correlation between access to microcredit and women’s entrepreneurial growth, with implications for policy design and rural development strategies.

Keywords: Microcredit, Women Empowerment, Rural Entrepreneurship, Financial Inclusion, Microfinance.

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41 Effectiveness of Hand Reflexology upon Pain among Postcaesarean Mothers

Paper ID V11I5-1241 · Pages 258-263 · Midwifery

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Introduction: Caesarean section (C-section) remains a prevalent surgical intervention globally, Postoperative pain is one of the most common therapeutic problems in hospitals. The study aims to evaluate the effectiveness of hand reflexology upon post caesarean pain. Materials and Methods: A quasi-experimental pretest-post-test design was used to achieve objectives. Mothers were selected through total enumerative sampling with a sample size of 70 mothers, among them 35 were assigned to control and interventional group.The researcher collected the data using demographic variable proforma, obstetrical proforma, a Numerical pain rating scale, and a Rating scale to assess the acceptability of Hand reflexology through interview. Results: The study found that all mothers in the control group experienced severe pain before and after therapy, while in the intervention group, severe pain reduced from 100% to 54.29% at 30 minutes and to 60% at 60 minutes. Pain scores in the control group showed minimal reduction (8.71 to 8.51, t=2.02; 8.71 to 8.57, t=1.53), whereas the intervention group experienced a significant decrease (8.4 to 6.91, t=10.11; 8.4 to 6.77, t=13.97). Significant associations were found between pain levels and factors such as occupation (χ^2=7.38, p

Keywords: Hand Reflexology, Pain, Post Caesarean Mothers.

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42 The Digital Catalyst for India’s Green Transition: Applying AI-Driven Recommender Systems and Natural Language Processing to Enhance Sustainable Supply Chains in Tier 2 MSMEs

Paper ID V11I5-1251 · Pages 264-268 · Artificial Intelligence

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This paper proposes an AI-driven marketplace that leverages Natural Language Processing (NLP), Document Intelligence, and Learning-to-Rank (LTR) models to resolve market frictions of discovery, trust, and compliance. NLP structures fragmented product data, while document AI verifies sustainability claims aligned with frameworks like BRSR, EPR, and MSME ZED certification. LTR algorithms prioritise verified green suppliers, incentivising sustainable practices. The platform also ensures inclusivity through cross-lingual conversational agents, fairness audits, and interoperability via ONDC. By enabling verifiable “green matching,” the system supports corporate Scope 3 emission reductions while advancing SDGs. The research demonstrates how AI marketplaces can serve as digital infrastructure for climate resilience and inclusive economic growth in India’s green transition.

Keywords: Artificial Intelligence, Natural Language Processing, Responsible AI.

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43 Insilico Screening of Bioactive Compounds Derived from Catharanthus Roseus against Anticancer Activity

Paper ID V11I5-1271 · Pages 269-275 · Cadd

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One of the most prevalent diseases in the world is cancer. In order to stop cancer from growing, developing, and spreading, cancer treatments still need to be carefully planned and targeted. Radiation, cellular stress, and cytotoxic medications are some of the triggers that activate the mitochondrial intrinsic apoptotic pathway. Native to the Mediterranean region, Vinca roseus is a blooming perennial plant that is primarily found in the northern hemisphere. They are native to tropical regions in South Asia. There are numerous uses for the Madagascar plant, Catharanthus roseus L. The 3D crystallographic structure of the Anti-cancer receptor (PDB ID-2KCE & 2HBS) was obtained from the Protein Data Bank and utilized as a protein target for in-silico experiments. Molecular docking was performed using Auto Dock 4 and Auto Dock Vina. A blind docking approach was employed to encompass all possible ligand binding sites. The binding free energy (kcal/mol) was utilized to calculate the binding affinity. This study reveals that Catharanthus roseus, a polyphenolic compound, may possess antioxidant, antibacterial, antifungal,&anticancer activity against the Anti-cancer receptor responsible for cancer disease, as predicted in silico. Molecular docking data suggest that Vincristine(-7.1& -9.5 Kcal/mol) and Vindesine (-9.1 & -10.5 Kcal/mol) have greater activity than Vincristine. They have good Anticancer properties. & The best protein was found to be 2HBS for Anti-cancer activity.

Keywords: Catharanthus roseus, Anti-cancer, Vincristine, Vindesine, 2HBS.

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44 Exploring the Future Career Potential of Blender 3D as a Professional Tool

Paper ID V11I5-1226 · Pages 276-280 · Animation And Digital Media

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We examine an open source 3D set of tools called Blender, as a powerful tool for concept design and the many ways it can be used as a career, with main uses being through game design, architecture and design for the film industry. This paper also talks about the traditional methods of animation and how Blender has improved them. The unique features of Blender are examined in terms of ease of use and integrated nature, since Blender incorporates a simulation engine and a game engine that can be used creatively in the design process. The unique data structure of Blender is examined with the features and workflow that this structure brings to the design process. Also, a simple comparison is made between Blender and 3D Max in terms of features and workflow as visualisation tools.

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Keywords: Blender, Simulation, Workflow, Animation, Structure.

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45 Exchange Rate Volatility and Its Impact on Bilateral Trade and Economic Stability: A Comparative Analysis of India and China

Paper ID V11I5-1272 · Pages 281-286 · Economics

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This paper examines exchange-rate volatility in India and China from 2010–2024 and evaluates its implications for bilateral trade and economic stability. While extensive research exists on exchange-rate dynamics in individual emerging economies, limited comparative analysis has been conducted on the asymmetric volatility between the Indian rupee (INR) and the Chinese yuan (CNY), and its effects on India–China trade relations. Using quarterly data on INR/USD, CNY/USD and INR/CNY exchange rates, combined with GDP, inflation and trade indicators, this study compares volatility patterns and investigates how major global shocks influence the two currencies differently. The analysis shows that India's flexible exchange-rate regime produces consistently higher volatility, especially during periods of international financial stress, whereas China's managed-float framework ensures greater currency stability. These asymmetries have tangible economic implications: heightened INR volatility undermines India's export competitiveness, increases import costs, and contributes to a widening trade deficit, while China's stable currency environment supports predictable pricing and resilient trade flows. The study concludes that managing exchange-rate volatility is essential for enhancing India's competitiveness and economic stability in its trade relationship with China.

Keywords: Exchange Rate Volatility, Bilateral Trade, India, China, Quarterly.

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46 SmartRentConnect

Paper ID V11I5-1266 · Pages 287-292 · Web Application Development

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Managing rental properties in urban areas can be challenging due to the complexities of multiple systems and paperwork. SmartRentConnect addresses these issues with a comprehensive web application that streamlines rental management. Tenants can easily search and book properties, pay rent, submit complaints, and create guest passes, all while receiving automated reminders. Property owners can manage listings, track payments, and generate revenue reports, while administrators monitor activities and generate insights. Security is enhanced through QR code verification for guest passes. Built with modern technologies like React [10] with TypeScript and Tailwind CSS for the frontend, and Spring Boot for the backend, SmartRentConnect also integrates Razorpay for payments, Google Maps API for property searches, and jsPDF for documentation. With

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features like user authentication, role-specific dashboards, and automated notifications, SmartRentConnect improves communication, efficiency, and reliability in rental management.

Keywords: SmartRentConnect, Rental Management, Property Booking, Rent Payments, Guest Pass Management, QR Code Verification, Automated Reminders, React [10]JS, Spring Boot, Property.

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47 Design and Analysis of a Smart Drainage Alert System Using IoT Sensors

Paper ID V11I5-1254 · Pages 293-294 · Engineering

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In the past years, urban flooding due to clogged drains has been a persistent problem in many Indian cities. Even well-planned areas like Gurugram that lie in the NCR region faced extreme waterlogging during monsoons. This research presents a low-cost Smart Drainage Alert System that uses IoT sensors to monitor water levels and detect possible blockages. The proposed model uses an ultrasonic sensor to detect rising water levels, connected to a microcontroller and cloud platform for live data tracking. When the water levels exceed a set threshold limit, the system sends an alert to the user via a mobile application. A small-scale prototype demonstrates that IoT-based monitoring can provide affordable, effective drainage management for communities.

Keywords: IoT, Smart Drainage System, ESP32, JSN-SR04T Ultrasonic Sensor, MIT App Inventor, Real-Time Flood Monitoring, Smart City Infrastructure.

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48 Judicial Accountability and Institutional Reform: A Methodological Framework for Assessing the Amendment to the Judicial Conduct & Removal Regime in India via the Yashwant Verma Affair

Paper ID V11I5-1275 · Pages 295-300 · Law-ip

Srihari, Research Scholar, Amity University, Delhi

The integrity and independence of the judiciary are the twin pillars of constitutional democracy. However, the recent Justice Yashwant Varma affair—involving a probe initiated under the supervision of Chief Justice D.Y. Chandrachud and recommendations by Justice Sanjiv Khanna— has reignited national debate on the adequacy of India's mechanisms for judicial accountability. This research seeks to evaluate the potential amendment and reform of the judicial conduct and removal regime through a combined doctrinal-empirical approach. It will analyse the constitutional and statutory framework governing judicial conduct (Arts. 124–137, 217–222 of the Constitution; Judges [Inquiry] Act 2, 1968), examine procedural lacunae revealed by the Varma inquiry, and propose a methodological framework to assess future reforms. The study situates the case within the broader question of how India can reconcile judicial independence with accountability and transparency. This research explores how the Justice Varma episode and Justice Khanna's proactive stance may signal the beginning of a long-overdue amendment to the judicial accountability framework in India. Adopting a mixed-method approach that integrates doctrinal legal analysis with empirical qualitative research, the study examines constitutional

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provisions (Articles 124–147 and 217–222), the Judges (Inquiry) Act, 1968, and the 1999 in-house procedure to identify institutional gaps and reform needs. It further draws comparative insights from other common-law jurisdictions such as the United Kingdom and Canada, where judicial conduct mechanisms operate with transparency and independence. By framing a methodological model that evaluates both legal norms and real-world perceptions, this research aims to contribute to scholarly and policy discourse on how India can evolve a codified, transparent, and ethically resilient framework for judicial accountability—one that safeguards both public confidence and judicial autonomy.

Keywords: Constitution of India, In-House Procedure, Arun K. Thiruvengadam, Judicial Ethics.

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49 Smart Irrigation System Using IoT

Paper ID V11I5-1297 · Pages 301-305 · Technology

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This paper presents the design and implementation of a Smart Irrigation System using Internet of Things (IoT) technologies for efficient agricultural water management. The system utilizes an Arduino Uno microcontroller, soil moisture sensors, and a GSM communication module to automate irrigation processes. By integrating real-time soil data with cloud-based storage through Firebase, it ensures data accessibility, analysis, and remote monitoring. The experimental results demonstrate water savings of approximately 35–40% and an energy reduction of 20% compared to conventional irrigation methods. The proposed system enhances sustainability and supports precision agriculture practices.

Keywords: IoT, Smart Irrigation, Soil Moisture Sensor, GSM, Arduino, Automation, Precision Agriculture.

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50 Impact of AI and Automation on Employee Upskilling Needs

Paper ID V11I5-1268 · Pages 306-312 · Human Resource Management (hrm) And Technological Change

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Artificial Intelligence (AI) and automation are transforming the global labour market by redefining job roles, required competencies, and organisational learning priorities. This study investigates the growing need for upskilling among employees as workplaces adopt AI-enabled systems. The study combines insights from established global and Indian literature with sample-based data to analyze how AI adoption impacts workforce readiness and skill development. Data from institutional reports such as the International Association of Workforce Professionals (2024), All Multidisciplinary Journal (2025), SDMIMD HR Conference (2023), and Taylor & Francis (2021) were examined alongside sample dataset analysis. The findings indicate that while

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automation displaces repetitive jobs, it simultaneously generates demand for complex cognitive, technical, and interpersonal skills. Indian organizations are rapidly adopting AI tools but often lack structured training mechanisms to address the emerging skill gap. The study emphasizes that strategic upskilling programs, leadership involvement, and policy support are critical for sustaining employability and competitiveness in the AI era.

Keywords: Artificial Intelligence, Automation, Employee Upskilling, Future of Work, Skill Development, Human Resource Management.

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51 Experimental Investigation of Coconut Shell as a Lightweight Aggregate in Concrete

Paper ID V11I5-1292 · Pages 313-315 · Civil Engineering

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This experimental study investigates the feasibility of utilising coconut shell as a partial replacement for conventional coarse aggregates in M20 grade concrete. The aim is to evaluate the mechanical and physical properties of lightweight concrete produced using varying percentages of coconut shell aggregates (0%, 10%, 20%, and 30%). Experimental parameters such as workability, density, and compressive strength at 7, 14, and 28 days were analysed. Results indicated that a 20% replacement of coarse aggregates with coconut shells provided an optimal balance between strength and weight reduction, making it suitable for non-structural and low-load-bearing applications. The study concludes that coconut shell concrete is an eco-friendly alternative for sustainable construction practices.

Keywords: Lightweight Concrete, Coconut Shell Aggregate, M20 Grade, Compressive Strength, Sustainable Materials.

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52 A Comparative Study of Machine Learning Models for Predictive Analytics in Detecting Security Breaches Across Industrial IoT-Based Critical Infrastructure in U.S. Organizations

Paper ID V11I5-1314 · Pages 316-334 · Iot Security

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Industrial Internet of Things (IIoT) technologies have emerged with significant security challenges due to increasing interconnectivity and network complexity. Thus, this study proposes and tests a centralized deep-

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learning intrusion detection system (IDS) particularly designed for IIoT networks. Convolutional Neural Networks (CNNs) and Multilayer Perceptrons (MLPs) were implemented in PyTorch and TensorFlow, and their performance was assessed on the CIC IoT-DIAD 2024 dataset to simulate real industrial traffic and varied attack vectors. Accuracy, precision, recall, F1-score, and confusion matrices were used for the evaluation metrics. Results showed that the TensorFlow CNN achieved the highest detection rate (80.1%), followed very closely by the PyTorch CNN (77.3%), highlighting the superior performance of CNN architectures, especially on TensorFlow, in recognizing intricate spatial patterns in IIoT traffic. The comparative research enhances IIoT cybersecurity research by identifying efficient deep learning models for intrusion detection and proposing a framework for adoption in industrial systems to improve resilience and mitigate vulnerability to advanced cyberattacks.

Keywords: IIoT, Critical Infrastructure, Cyberattack, Deep learning, Pytorch, TensorFlow.

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53 A Comprehensive Analysis of Why Startups Fail

Paper ID V11I5-1312 · Pages 335-340 · Business

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Young enterprises significantly contribute to fostering creativity and boosting national prosperity; however, many of them encounter substantial setbacks during their early stages. The study examines the major factors contributing to business failures by integrating scholarly works and analyzing real-world examples. Research suggests that an unmet marketplace need, coupled with insufficiently compelling offerings, continues to be the primary reason for failure in business ventures. Lack of financial resources, such as insufficient funds and poor management of cash flows, intensifies volatility. Business strategies lacking in scalability or profit potential frequently result from inadequate strategic foresight, leading to premature failure at the inception stages. Moreover, poor teamwork, disagreements among leaders, and a lack of flexible abilities impede productivity and strategic thinking. Exogenous factors like compliance hurdles, innovation shifts, and global economic fluctuations exacerbate inherent organizational flaws. This research incorporates findings from reports like the Startup Genome Report and analysis by CB Insights to classify failures based on both intrinsic factors related to strategy, finances, management, and extrinsic elements affecting market conditions and environments. The document underscores that achieving successful startups requires skill in strategy, precise market fit validation, robust management skills, and continuous improvement through repetition. This research provides an analytical model of how startups fail, helping business owners, financiers, and government officials manage risks effectively and make well-informed choices.

Keywords: Startup Failure, Market Misfit, Business Model, Entrepreneurial Finance, Team Dynamics, External Challenges, Failure Frameworks

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54 A Study on the Relationship between Air Pollution and Housing Prices in Indian Metropolitan Cities

Paper ID V11I5-1324 · Pages 341-348 · Economics

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This paper aims to examine whether air pollution has a significant impact on residential housing prices in Indian metropolitan cities, which include NCR, Mumbai, Kolkata, Bangalore, and Chennai. The data for both variables is from 2017 to the beginning of 2025. It uses secondary data from the Housing Price Index (HPI) and the Central Pollution Control Board (CPCB). This paper is purely a quantitative analysis, and compares the trends of PM2.5, PM10, NO_2, and Ozone, with the movements of the housing prices. The findings reveal that there is no direct correlation between the air quality and housing prices across the selected cities. However, factors such as infrastructural and connectivity development, employment opportunities, migration, etc., are found to play a significant role in the housing prices to experience an upward trend. The dependence on mainly two indices limits the scope of the study; however, it also highlights an important implication. Pollution does not affect the valuation of residential complexes. Therefore, there is little to no incentive for sustainable urban development. Measures like Government intervention, inclusion of social/environmental costs in the real estate business, could encourage eco-friendly and greener housing practices.

Keywords: Air Pollution, Housing Prices, Metropolitan Cities, India, Correlation Analysis, Real Estate Market, Environmental Economics

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55 Efficiency of Carbon Fibre for the Automotive Industry

Paper ID V11I5-1244 · Pages 349-351 · Automotive Engineering

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This paper explores the role of carbon fibre reinforced plastic (CFRP) in improving the efficiency, safety and sustainability of modern automobiles. The aim is to determine how beneficial carbon fibre is in making vehicles lighter, cleaner and more energy efficient. It examines CFRP's advantages over traditional materials such as steel and aluminium, its applications in vehicle design and the manufacturing challenges that limit large-scale use. The paper also discusses recycling methods and environmental improvements that make CFRP more sustainable, along with future prospects for its wider use in the automotive industry.

Keywords: Carbon Fibre Reinforced Plastic (CFRP), Lightweight, Cars, Automotive Design, Safe, Energy, Environmental Sustainability.

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Echo Scan – AI Detection of Synthetic and Fake Voices

Paper ID V11I5-1298 · Pages 352-356 · Artificial Intelligence (ai) And Machine Learning

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In a world where voice-based technologies are rapidly evolving, the rise of AI-generated synthetic voices poses serious concerns for authenticity, privacy, and security. Echo Scan is a machine learning-based system designed to differentiate between real human voices and artificially generated ones. The system leverages acoustic features, waveform analysis, and deep learning techniques to identify subtle inconsistencies that are often overlooked by the human ear. Through extensive training on diverse datasets and voice patterns, Echo Scan aims to act as a reliable shield against voice cloning, fraud, and misinformation. This project not only strengthens digital trust but also sets the foundation for future advancements in audio forensics and secure voice authentication.

Keywords: AI Voice Authentication, Synthetic Voice Detection, AI-generated Speech, Audio Forensics, Deep Learning.

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