IEEE INTERNATIONAL CONFERENCE

On

Computational, Communication and Information Technology

ICCCIT-2025

(7th - 8th February 2025)

BOOK OF ABSTRACTS

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Preface

We are delighted to present the Book of Abstracts for the IEEE International Conference on Computational, Communication, and Information Technology (ICCCIT-2025), a premier forum for the exchange of innovative ideas, research findings, and technological advancements in these rapidly evolving fields.

The objective of this conference is to bring together leading researchers, academicians, industry practitioners, and students from across the globe to share their insights and explore the challenges and opportunities in computational sciences, communication networks, and information technologies. The abstracts compiled in this volume reflect the diverse spectrum of research being undertaken to address real-world problems and to pave the way for future innovations. This conference received an overwhelming response, with around 800+ manuscript submissions all over the world like USA, UK, Bangladesh, Philippines, Sri Lanka, Saudi Arabia, China, Pakistan and many more countries spanning cutting-edge topics such as artificial intelligence, machine learning, IoT, cloud computing, quantum computing, 6G and beyond communication technologies, cybersecurity, and data analytics. Each submission was meticulously reviewed by a panel of experts to ensure high-quality content that aligns with the goals of the conference. We extend our deepest gratitude to the keynote speakers, authors, reviewers, and session chairs who have contributed to the success of this event. We also express our sincere appreciation to our sponsors IEEE MP Section and IEEE Computer Society MP Section, organizing team for their unwavering support and dedication.

It is our hope that this Book of Abstracts not only serves as a valuable resource for all participants but also inspires collaboration and innovation that extend beyond the conference. These abstracts are a testament to the collective efforts of our participants in advancing knowledge and promoting innovation. May it ignite discussions, spark new ideas, and lead to impactful solutions in the fields of computational, communication, and information technology.

On behalf of IPS Academy, Institute of Engineering and Science, we welcome you to this remarkable event. We hope you find this conference intellectually stimulating and professionally rewarding. Together, let us continue to push the boundaries of knowledge and technology for a brighter future.

Warm regards,
Organizing Committee ICCCIT-2025

Acknowledgment

We are profoundly thankful to the IEEE MP Section and IEEE Computer Society MP Section as sponsors for their unwavering support and partnership, which have been integral to the success of this conference. Your contributions have helped us provide a platform for researchers, professionals, and students to connect and exchange ideas. Their assistance has been crucial in raising this conference's academic caliber and prominence.

We are immensely grateful to our distinguished guests, keynote speakers, session chairs, panelists, and expert guests for sharing their expertise and providing insightful perspectives on the latest trends and challenges in the field. Your presence has greatly enhanced the quality and relevance of this conference.

We also express our heartfelt appreciation to the participants, researchers, and academicians who traveled from near and far to present their innovative ideas and share their research findings. Your enthusiasm and engagement have enriched this conference and fostered a spirit of collaboration and mutual learning.

Our profound gratitude goes to the management, faculty, and staff of IPS Academy, Institute of Engineering & Science whose vision, support, and state-of-the-art facilities were instrumental in the seamless execution of this event. The encouragement and resources provided by the institution have been pivotal in creating an environment conducive to innovation and learning.

Lastly, we acknowledge the efforts of the students and volunteers, whose hard work behind the scenes ensured the smooth operation of every session, interaction, and activity. Your energy and dedication are truly commendable and appreciated.

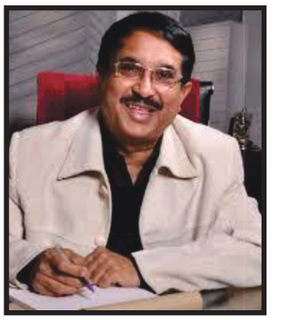
This conference has not only served as a forum for intellectual exchange but has also strengthened bonds within the academic and professional community. We are hopeful that the relationships and collaborations initiated here will continue to grow, paving the way for impactful innovations and transformative solutions for a better tomorrow.

With heartfelt appreciation, we look forward to continued collaboration and advancements in the exciting fields of computational, communication, and information technology.

Warm regards,
Organizing Committee ICCCIT-2025

MESSAGES

Message of President



It is with immense pride and enthusiasm that I extend a warm welcome to the proceedings of the IEEE International Conference on Computational, Communication, and Information Technology (ICCCIT-2025), hosted by the Department of Computer Science Engineering at our institute on February 7-8, 2025.

This prestigious conference serves as a dynamic forum for thought leaders, researchers, academicians, and industry pioneers to converge, share groundbreaking ideas, and explore transformative innovations in computational and communication technologies. Such collaborations are essential in driving progress and shaping the future of our interconnected world.

I deeply appreciate the relentless efforts of the organizing team, whose vision and dedication have made this event possible. My heartfelt gratitude also goes to IEEE, our sponsors, and all participants for their unwavering support and contributions.

May ICCCIT-2025 inspire new frontiers of research, foster meaningful partnerships, and leave an indelible mark on the global technological landscape. Wishing all participants, a profoundly enriching and successful experience.

Ar. Achal K. Choudhary
President
IPS Academy

Message of Principal & Conference Chair



It gives me immense pleasure to welcome you all to the IEEE International Conference on Computational, Communication and Information Technology ICCCIT-2025 organized by the Computer Science Engineering Department of our institute on February 7-8 February, 2025.

Education has always been a hallmark of progress and development. It should be research-driven, aiming to empower society by fostering innovation and creating new opportunities. Thinking creatively and embracing novel approaches is essential to keep pace with rapid technological advancements. This conference serves as a platform for scholarly discussions on advanced computing and provides an avenue to explore various dimensions of education through the effective application of information technology.

The enthusiastic response from contributors and like-minded members of the educational community has been truly inspiring. The presentation of research papers during this conference is not only invaluable for research scholars but also serves as a motivating factor for us to organize such events more frequently. I extend my heartfelt gratitude to all participants who have enriched this conference with their research contributions.

I am confident that the conference will fulfill its objective of offering a meaningful platform for learning and engaging with the latest advancements in the research. Organizing such events requires the cohesive efforts of a dedicated and committed team, and we are fortunate to have such a hardworking team supporting us.

I wish the conference great success and hope it becomes a memorable and impactful event for all participants.

Dr. Archana Keerti Chowdhary
Principal & Conference Chair
IPS Academy
Institute of Engineering & Science

Message of Dean Student Welfare & Program Chair



It is my great pleasure to welcome you all to the IEEE International Conference on Computational, Communication and Information Technology ICCCIT-2025 organized by the Computer Science Engineering Department of our institute on February 7-8 February, 2025.

This conference serves as a platform for advancing knowledge, fostering innovation, and exploring the integration of information technology in education. The enthusiastic participation of contributors highlights the importance of collaboration in driving intellectual growth and technological progress.

I extend my sincere gratitude to all researchers and contributors for their valuable insights and commend the dedicated team whose efforts made this event possible. I am confident this conference will inspire innovation and pave the way for future advancements in Industry. Wishing everyone a successful and enriching experience!

Dr. Keerti Kumar Chowdhary
Dean Student Welfare & Program Chair
IPS Academy
Institute of Engineering & Science

Message of Head CSE & Convener



On the behalf of organizing committee, I welcome you to the IEEE International Conference on Computational, Communication, and Information Technology (ICCCIT-2025) hosted by Department of Computer Science & Engineering, IPS Academy, Institute of Engineering and Science, Indore on 7th – 8th February 2025, sponsored by IEEE MP Section and IEEE CS MP Section.

It is with great pleasure that we gather here for this prestigious event, where the latest advancements in computational sciences, communication technologies, and information systems are showcased. As convener, I am thrilled to bring together scholars, researchers, engineers, and industry professionals from across the globe to share their innovative ideas, discuss emerging trends, and explore collaborative opportunities in computational and information technological aspects of contemporary computing.

This conference serves as a platform for cutting-edge research and insightful discussions on the rapidly evolving fields of computational intelligence, communication networks, information systems, and technology applications. The theme of this conference reflects our commitment to addressing contemporary challenges and driving innovation through interdisciplinary efforts. The contributions from the academic and industrial communities provide a rich blend of theory, experimentation, and real-world applications that will pave the way for future developments and breakthroughs in these critical areas. We are delighted to present a rich program featuring keynote speeches, expert talks, and panel discussions carefully designed to ensure an enriching experience for all participants.

I sincerely thank all the authors, reviewers, keynote speakers, and participants for their valuable contributions in making this conference a success. We hope that the discussions and networking opportunities at ICCCIT-2025 will foster new collaborations and inspire meaningful discussions, sparks innovative ideas, in research and technology.

Wishing you an enriching and productive experience at ICCCT-2025.

Dr. Neeraj Shrivastava
Head CSE & Convener
IPS Academy
Institute of Engineering & Science

EXPERT TALKS

Optimal Resource Scheduling in Cloud Computing Environment

Dr. Umar Muhammad Modibbo
Senior Reasearcher
Modibbo Adama University, Yola, Nigeria

Profile:



Dr. Umar Muhammad Modibbo is Senior Reasearcher from Modibbo Adama University, Yola, Nigeria. He Received a P.hD. in Operations Research. He obtained his Master of Technology (M.Tech) and Bachelor of Technology (B.Tech) degrees in Operations Research at the Federal University of Technology, Yola, Nigeria (Now The Modibbo Adama University of Technology, Yola) in 2016 and 2010 respectively. Dr Modibbo is a recipient of the University grant to study M.Tech. Operations Research in 2014, a Nigerian Tertiary Education Trust Fund (TETFund) to study PhD. Operations Research in 2018. He is a recipient of a Young Researcher Award and Research Excellence Award from Institute of Scholars (InSc) India, 2020. His research areas include Mathematical Programming and its Applications, Reliability Optimization, Fuzzy Programming, Multi-objective Optimization, Inventory \& Supply Chain Management, and Sustainable Development Goals. He is Fellow, and President of Operations Research Institute for Decision Sciences & Analytics of Nigerian [ORIDSAN], an executive Member, African Federation of Operations Research Societies [AFROS], International Federation of Operational Research Societies [IFORS] and Operational Research Society of India. He has published more than 50 research articles in journals of national and international repute with over 1000 google scholar citations, and he attended many conferences and workshops in his domain area serving as guest speaker, and session chair. He is a reviewer of many national and international reputed journals.

Abstract:

The ever-changing world of cloud computing offers new issues in resource allocation as distant systems struggle with overloaded conditions. In this regard, a cutting-edge enhanced dynamic Johnson sequencing algorithm (DJSA) is designed to successfully address resource scheduling difficulties in cloud computing environments. With a solid base in the DJSA, OptiDJS+ enhances it to meet the needs of modern cloud infrastructures. OptiDJS+ uses advanced optimization algorithms, heuristic approaches, and adaptive mechanisms to optimize resource allocation, workload distribution, and job scheduling. To achieve optimal performance, this technique employs historical data, dynamic resource reconfiguration, and response to changing workloads. It accomplishes this by combining real-time monitoring with machine learning. It considers elements such as load balance and makeup. We think that OptiDJS+ opens the way for more dependable and effective cloud computing eco-systems, assisting in the full realization of cloud technologies' promises across a range of application areas.

The future of Technology: Will we be ready?

Dr. Vikram Bhadauria
College of Business, Engineering, & Technology
Texas A&M University in Texarkana, Texas, USA

Profile:



Dr. Vikram Bhadauria serves as the Chair of the Information Systems & Computing Technologies Division and holds the rank of tenured associate professor in the College of Business, Engineering, & Technology at Texas A&M University in Texarkana, Texas, USA. He received his PhD in Business Administration specializing in Management Information Systems from the University of Texas at Arlington, Texas. Besides two masters, he also holds a bachelor's degree in engineering from SGSITS, Indore.

Dr. Bhadauria, a seasoned teacher with over two decades of experience, is developing new courses and programs in Computer Science and Management Information Systems. He is currently introducing two graduate programs, MS in Business Data Analytics and MS in Artificial Intelligence and Machine Learning, to meet the IT industry's demand. Dr. Bhadauria is a prolific researcher, publishedmany articles and presented at numerous conferences. His research areas include software development methodologies, environmental sustainability, security, blockchain, IoT, and self-driving technology adoption. His research publications appear in leading journals such as Journal of Association for theInformation Systems, Journal of Database Management, Computers in Human Behavior,Industrial Management & Data Systems, Information & Computer Security, Journal of Information Systems Education, amongst other journals. Dr. Bhadauria's research has been cited over 2,600 times, which speaks highly of his contributions to the body of knowledge.

Abstract:

Rapid advances in computing power, communication systems, and information technologies transform the way we conduct business and interact with each other. As technological innovations proliferate our lives, it is prudent to reflect on our limitations and preparedness to assimilate and thrive in the blistering pace of change. While AI promises quick data driven solutions, the bias in the input data has ethical and societal implications. AI might profit global north more than the global south. Higher computational power could intensify climate change. When singularity seems to be on the horizon, question is, will we be able to remain “the captain of our boat, the master of our fate”?

Transforming Connectivity for a Smarter Future: IoT meets AI

Dr. Nalika Ulapane
La Trobe University,
Melbourne Victoria Australia

Profile:



Nalika Ulapane is a researcher who integrates mathematical modelling, engineering systems design, data analytics, and design science research principles to address challenges in complex systems, including smart sensors, AI applications, and next-generation healthcare. He has held various research and teaching positions at several Australian institutions, including the University of Technology Sydney, the University of Melbourne, La Trobe University, Swinburne University of Technology, and the Olivia Newton-John Cancer Wellness & Research Centre. Additionally, Dr. Ulapane serves in several editorial roles for academic journals and books that focus on the application of AI in complex systems.

Abstract:

We are in an era of digital transformation. Over the years, the Internet of Things (IoT) and Artificial Intelligence (AI) have made groundbreaking strides alongside many other technologies, paving the way for different generations of industrial revolution. Currently, interest lies in the convergence of IoT and AI, revolutionizing connectivity to enable smarter technologies. This keynote delves into how the combination of AI capabilities with IoT ecosystems facilitates real-time data processing, predictive analytics and maintenance, and autonomous decision-making. Attendees will explore various use cases such as smart cities, industrial IoT, intelligent systems, and more, highlighting the synergy between IoT and AI in creating a smarter, interconnected future.

Latest Trends in High Performance Computing

Dr. Alpana Rajan
Associate Director, TDSG and Head, Computer Division
Raja Ramanna Centre for Advanced Technology, Indore

Profile:



Dr. Alpana Rajan joined Department of Atomic Energy (DAE) in 1989 at Bhabha Atomic Research Centre, Mumbai. She joined Raja Ramanna Centre for Advanced Technology, Indore on transfer from BARC in 1991. She graduated in Computer Engineering from Shri G. S. Institute of Technology and Science, Indore in 1988 and acquired her MS (Software Systems) from BITS, Pilani in 2005. She was awarded PhD for her work in the field of high-performance computing clusters by Devi Ahilya Vishwavidyalaya (DAVV), Indore in the year 2014.

Presently, she is working as Outstanding Scientist and Associate Director of Technology Development and Support Group at Raja Ramanna Centre for Advanced Technology (RRCAT), Indore which is R&D unit of DAE. She leads Computer Division at RRCAT and her research interests include High Performance Computing, Machine Learning, Intelligent Systems and Cyber Security.

She has played pivotal role in establishing centralised computing facility for R&D projects at RRCAT and has spearheaded deployment of high-performance computing clusters for simulation and modelling applications. She has planned, designed and deployed High Performance Computing Clusters providing 240 Tera Flops of sustained computing power to the scientists and engineers of RRCAT.

She is currently leading a team of 57 engineers and software professionals. She has more than 110 publications in journals and peer reviewed conferences. She received Devi Ahilya Bai Holker Nari Gaurav Alankaran Award in 2014 for her outstanding contributions in the field of Science and Technology and also DAE Excellence in Science, Engineering, Technology Group Achievement Award.

Abstract:

Emerging technologies are shaping the future of high performance computing, redefining industries and scientific endeavors. Exascale computing, AI, quantum, neuromorphic, and analog computing are revolutionizing AI workloads, while innovative cooling approaches and energy-efficient hardware design are needed. As computing power demands grow, sustainability becomes crucial, necessitating innovations for energy-efficient processors and power management. The convergence of these technologies will drive the next wave of scientific, industrial, and societal progress.

Cyber Physical Systems Security

Dr R.K. Pateriya
Professor,
MANIT Bhopal

Profile:



Dr R. K. Pateriya is presently working as a Professor in Computer Science and Engineering Department of MANIT, Bhopal. He has more than 33 year of experience. Currently he is Chairman, Central Computing Facility. He has served the institution on various key positions like HOD(CSE), Associate Dean, Chief Warden etc. He is also Principal Investigator of ISEA Project(Govt of India). He has supervised more than **14 PhD scholars** and guided more than **350 B.Tech and M.Tech. students**. He has published more than **150 research papers** in reputed journals and conferences. He has authored a book and contributed several book chapters. He has delivered many keynote speech and invited talk in International / National Conferences / Workshops. He has visited many countries including Australia, China, Singapore, Hong-kong for academic collaborations. His research interests includes Machine Learning, Cloud Computing, Cyber security.

Abstract:

Cyber-Physical Systems (CPS) seamlessly integrate computing, networking, and physical components, playing a crucial role in industries such as healthcare, transportation, manufacturing, and critical infrastructure. As these systems become increasingly interconnected, they face growing cybersecurity threats that can compromise functionality, safety, and privacy. Ensuring the security of CPS requires a multi-layered approach, combining advanced encryption, real-time threat detection, intrusion prevention, and resilience strategies.

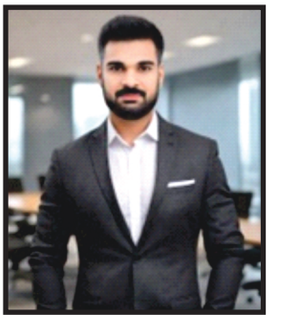
This expert talk explores key security challenges in CPS, addressing attack surfaces, risk assessment, and defense mechanisms. Discussions will include AI-driven security solutions, anomaly detection, secure communication protocols, and the role of blockchain in enhancing CPS integrity. Additionally, best practices for ensuring system reliability and compliance with evolving cybersecurity regulations will be covered.

By understanding emerging threats and implementing robust security frameworks, organizations can protect CPS from cyber risks and ensure their safe operation. This session aims to provide valuable insights into securing CPS in an increasingly connected world.

Bringing Ancient Wisdom by Connecting with the Advanced Modern Technology

Mr. Narender Chinthamu
Founder & CEO of MahaaAI,
Senior Lead Enterprise Architect, Texas, USA

Profile:



Mr. Narender Chinthamu, founder and CEO of MahaaAI, is a visionary innovator integrating ancient wisdom with modern technology. Recognized by NASA, Harvard, and MIT, he excels in AI, robotics, and astrophysics, holding over 108 global patents and authoring numerous publications.

Under his leadership, MahaaAI has developed a patented voice-based virtual assistant for smart recommendations, emotional analysis, and resource management, enhancing productivity and sustainability. The company also promotes eco-friendly jute products, replacing plastics, improving soil fertility, and generating employment, with over 4 million sustainable items produced annually.

Committed to social impact, Narender has spearheaded initiatives in real-time emergency tracking with drones, affordable healthcare, and instant access to doctors and law enforcement for vulnerable groups. His holistic approach merges ancient knowledge with modern science to create a sustainable and equitable future.He received various prestigious awards like Pillars of the Nation Award,Dr. APJ Abdul Kalam Puraskar Award,Indian Eminent Award,Next Generation AI-Based Smart Manufacturing Devices Startup,International Excellence Awards 2022 for Young Scientists,Bharath Samman Nidhi Award.Beyond his entrepreneurial endeavors, he is a respected author, keynote speaker, and chief editor of multiple esteemed international journals. His thought leadership and strategic vision continue to inspire advancements in technology and sustainability worldwide

Abstract:

The integration of ancient wisdom with advanced modern technology holds immense potential for addressing today's global challenges. Ancient cultures have long held knowledge of sustainable practices, ethical living, and holistic approaches to health, agriculture, and social structures. By connecting this time-tested wisdom with cutting-edge advancements in artificial intelligence, biotechnology, and digital tools, we can create solutions that are not only technologically advanced but also deeply rooted in sustainability and social responsibility.

This conference explores the interdisciplinary fusion of traditional knowledge systems with modern technologies, examining areas such as medicine, agriculture, education, and architecture. By blending the insights of ancient practices with the capabilities of modern innovation, we can improve efficiency, sustainability, and ethical standards. Participants will discuss how AI, smart technologies, and data analytics can enhance the relevance and application of ancient wisdom in the digital age, ultimately contributing to a more balanced, inclusive, and conscious future.

Impact and challenges in implementing AI in enterprises

Dr. Praveen RVS
Director Product Engineering,
LTIMindtree, USA

Profile:



Dr. Praveen RVS is a distinguished leader in data, product engineering, and innovation, bringing over two decades of expertise as a technology consultant and specialist in product development and conceptualization. Throughout his career, he has successfully led development teams and implemented software solutions, consistently delivering high-quality products on time and within budget.

As an accredited product strategist, Dr. Praveen possesses a proven track record in understanding, defining, and shaping client needs.With a background in enterprise architecture and comprehensive business analysis, he has hands-on experience in critical areas such as Enterprise BI, Data Visualization, Search-Based Data Discovery, Data Warehousing, Big Data Analytics, Advanced Analytics, Machine Learning, Artificial Intelligence, Computer Visioning, and Journey Analytics. He holds numerous certifications, including PMI PMP, SAFe 4.5 POPM, CCNA, MCP, MCTS, ITILV3, and Lean Six Sigma, and has patented over 20 innovations in AI, machine learning, and cloud computing. Additionally, he is the author of 9 cutting-edge technology books on data engineering, IoT, AI, and machine learning.

Beyond his professional achievements, Dr. Praveen is recognized as a leader in technology consulting and product development. He actively contributes to the academic community through his research and publications, aiming to bridge the gap between traditional knowledge and modern technological advancements.

Abstract:

The integration of artificial intelligence (AI) into enterprises offers transformative potential, driving operational efficiency, data-driven decision-making, and innovation across industries. AI enables automation of routine tasks, predictive analytics, and personalized customer experiences, fostering competitive advantage. However, its implementation faces significant challenges, including data quality and accessibility, integration with legacy systems, and a shortage of skilled talent. Ethical concerns, such as algorithmic bias and data privacy, alongside regulatory compliance, further complicate adoption. High implementation costs, organizational resistance to change, and cybersecurity risks also pose barriers. Success requires strategic alignment, robust governance frameworks, and cross-functional collaboration to balance technological capabilities with ethical and operational realities. Addressing these challenges is critical for enterprises to harness AI's full potential while ensuring sustainable and responsible deployment.

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Advancing Paraphrase Generation throughDeep Reinforcement Learning

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Abstract—This study addresses the challenge of generating high-quality paraphrases, a complex task in Natural Language Processing (NLP) that encompasses various essential subproblems. While neural networks have driven advancements, this study investigates the use of Deep Reinforcement Learning (DRL) to enhance paraphrase quality. Initially, a comparison of state-of-the-art supervised text generation approaches is conducted, revealing their limitations. Subsequently, strategies for knowledge transfer between supervised models and RL models are assessed using two intermediary environments. The impact of RL fine-tuning with different reward functions is then analyzed, highlighting the difficulties in designing effective reward functions for paraphrase generation. Findings suggest that employing an adversarial model as a reward function yields the best results. Additionally, the study proposes a general framework for transferring knowledge from supervised models to RL models, facilitating training efficiency. This work not only advances paraphrase generation but also offers a robust pipeline for applying RL in NLP applications.

Keywords:Deep Reinforcement Learning, Natural Language Processing, Paraphrases, Quality

Assessing the Determinants of GCash Payment Adoption Among College Students: A Combined Approach Using Task-Technology Fit and Technology Acceptance Models

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Abstract— This study examines factors influencing technology adoption among college students using the Task-Technology Fit (TTF) and Technology Acceptance Model (TAM). It investigates how task-technology alignment and perceptions of usefulness and ease of use affect usage and performance. Structural equation modeling with data from 400 students shows that technology acceptance constructs (TAC) and technology characteristics (TEC) significantly impact TTF, with coefficients of 0.318 and 0.602, emphasizing the role of user experience in optimal alignment. Results confirm that TTF positively influences both utilization and performance, enhancing ease of use and frequency. TAM findings reveal perceived usefulness as the primary driver of behavioral intention, significantly affecting actual usage. These findings highlight that promoting perceived usefulness, task fit, and user experience is crucial for effective technology adoption, offering guidance for technology developers.

Keywords:College students, Technology acceptance mode, Technology adoption, Task-technology fit, Structural equation model.

Optimizing Network Lifetime in Wireless Sensor Networks through Efficient Data Transmission

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Abstract—Wireless sensor networks (WSNs) are integral to modern applications ranging from environmental monitoring to military operations. Despite their utility, the limited energy capacity of sensor nodes remains a critical challenge, particularly during the most energy-intensive task of data transmission. This paper introduces a novel clustering-based communication protocol designed to optimize energy efficiency and extend the network lifetime. Unlike traditional protocols such as LEACH and SEP, the proposed algorithm minimizes redundant data transmission by employing a control mechanism that detects and skips identical data in successive rounds. This innovation reduces energy consumption during communication between non-cluster head nodes, cluster heads (CHs), and the base station (BS). Simulations conducted in static, semi-dynamic, and dynamic environments demonstrate significant improvements in network stability, energy efficiency, and overall lifespan. These results position the proposed protocol as a robust solution for energy-constrained WSNs.
Keywords: Energy Efficiency, Clustering, Wireless Sensor Networks, Redundancy

Enhancing Manufacturing Plant Productivity Through Advanced Plant Monitoring Systems

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Abstract— This paper discusses the importance of enhancing plant productivity through advanced plant monitoring systems, adopted in the digital era where companies strive to cope with technological advancements in the manufacturing industry. The paper offers a background for the need for monitoring systems in the manufacturing industry where product quality, labor intensity, adaptability to changes, and environmental concerns affect most companies. The paper's literature review identifies the barriers that hinder companies from adopting advanced plant monitoring systems, such as compatibility challenges with the existing systems. The analysis of the evolution of plant monitoring systems also offers a great understanding of the journey of manufacturing plant monitoring that has been undertaken in the current digital era. Therefore, the paper outlines various components of advanced plant monitoring systems, elements of data analytics in plant monitoring, and integration of artificial intelligence and machine learning in manufacturing. The benefits and challenges gathered across the discussion are then illustrated in the last section of the paper.
Keywords:Artificial Intelligence, Machine Learning, Sensor, IoT, Real-time data analytics

Validating Image Captioning Models Using Text-to-Image Algorithms via Generative AI

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Abstract—The potential of employing text-to-image models as validation tools for assessing the output of image captioning algorithms is investigated in this work. Using 5,000 images from the COCO dataset and textual descriptions produced by eight distinct image captioning models, we produce visuals. This work uses CLIPScore, a metric from the multimodal CLIP model, to evaluate the similarity between original and regenerated images using five well-known open-source text-to-image models. The findings show that CLIPScore offers useful information about the relative quality of captioning models, even though it is not entirely consistent with the evaluation of visual quality. Furthermore, tests with different prompt formats demonstrate that images with extremely thorough explanations are more like the originals than those with minimal descriptions. However, the scope was constrained by limited computer capabilities, resulting in results that were based on a smaller sample of the information. Nevertheless, the methodology provides a starting point for future studies on generative AI-based image captioning validation.
Keywords:AI, CLIP, COCO, Generative, Image

Sentiment Analysis and Topic Modeling of Patient Reviews on Psychiatric Medications Using Cloud-Based Architecture

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Abstract—This study conducts an in-depth investigation of patient feedback regarding psychiatric medications sourced from WebMD, with the objective of exploring the relationships between customer sentiment and drug ratings, as well as identifying recurring themes within the reviews. Employing sentiment analysis models, specifically Valence Aware Dictionary for sEntiment Reasoning (VADER) and RoBERTa, the research evaluates patient sentiments, while the Bidirectional Encoder Representations from Transformers (BERT) model is utilized to uncover prevalent topics within the feedback. The analysis reveals key themes, including drug effectiveness, side effects, and ease of use. The cloud-based infrastructure of the study, implemented via Docker and deployed on Amazon Web Services (AWS), facilitates scalable and efficient data processing, rendering it suitable for the analysis of extensive datasets. The results demonstrate significant correlations between patient sentiment and overall drug ratings, highlighting the importance of patient reviews as a valuable source of real-world insights into medication efficacy and user experience. This approach establishes a robust framework for future research in patient sentiment analysis and drug efficacy, thereby contributing to a more profound understanding of patient experiences with psychiatric medications.
Keywords:BERT, Patient, RoBERTa, Sentiment, VADER

Sustainable development through AI-driven FinTech in Agriculture: ABibliometric Analysis

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Abstract— This research presents a bibliometric analysis of the integration of AI-driven Financial Technology (FinTech) in agriculture, aiming to advance sustainable economic development. The study uses the Scopus database to analyze 1,747 FinTech related documents published since 2010, and investigates the intersections of FinTech and agriculture. On October 1, 2024, analysis was performed utilizing VOSviewer on key trends, challenges, and future prospects of AI, FinTech, and agricultural development. The findings reveal is that while FinTech has huge potential in transforming the agricultural sector by expanding access to finance, improving efficiency and creating innovation there has been very little research that captures how FinTech and AI work together in practice. In addition, the study also emphasizes research bias towards developed countries as opposed to developing ones where FinTech can disrupt the agriculture very much. Increased collaboration across disciplines and AI-FinTech applications are needed to achieve sustainable agricultural growth, the paper urges. This study is ultimately underscoring the potentials of AI driven FinTech solutions for rebuilding strong agricultural economies and contributing to global economic sustainability as a whole. Using bibliometric methods such as mapping co-authorship networks, co-word co-occurrence and citation facets, we gain important understanding of the Intellectual Landscaping of FinTech's role in agriculture.
Keywords:Artificial Intelligence (AI), Financial Technology (FinTech), Agriculture, Sustainable Development, Economic Development.

The Impact of TV White Space (TVWS) and 5GNetworks on Bimodal Learning for Master'sPrograms in Engineering Science at the HigherInstitute of Technology, University of Bangui

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Abstract— Abstract In this paper, we propose a digital solution for training master's students in engineering sciences using a bimodal learning approach at the Higher Institute of Technology at the University of Bangui. This proposal addresses the lack of master's-level programs in DevOps and Network Telecommunications, as well as the insufficient expertise of local educators in Information and Communication Technology (ICT). It also aims to strengthen the teaching of science, technology, engineering, and mathematics (STEM). The solution is based on remote learning platforms hosted in the public cloud, engaging students and teachers in a bimodal teaching model that delivers simultaneous instruction to both in-person and remote students via a high-speed TV White Space (TVWS) and 5G network. The expected impact is the training of competent engineers capable of successfully carrying out projects in the field of information and communication technology, thereby contributing to the development of the Central African Republic.
Keywords: Digital Training, STEM, Bimodal Teaching, High-Speed Networks

Deep Learning Techniques for Object Detection in Underwater Environments

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Abstract—The degradation of image quality caused by things like light absorption, scattering, and distortion makes object detection in underwater environments a unique challenge. Applications like marine research, environmental monitoring, and autonomous underwater vehicles (AUVs) are restricted in their effectiveness by traditional image processing techniques, which often struggle with these complexities. Recent years have seen the rise of deep learning techniques as a potent weapon in the fight against these obstacles. In order to accurately detect objects underwater, this paper investigates the use of deep learning models, specifically convolutional neural networks (CNNs). We explore cutting-edge models and methods like attention mechanisms, transfer learning, and hybrid deep learning architectures to improve detection performance in challenging underwater environments. Furthermore, we utilize data augmentation techniques and synthetic dataset generation to tackle the critical issue of limited labeled underwater datasets. From a detection accuracy and robustness perspective, the experimental results show that our suggested deep learning method is light years ahead of the competition. Marine exploration, autonomous underwater vehicle navigation, and underwater surveillance systems can all benefit from this study's new insights into how to better detect objects in real time while submerged.
Keywords: Deep learning, object detection, underwater environments, convolutional neural networks (CNNs), autonomous underwater vehicles (AUVs).

The Utilization of Brain-Computer Interfaces (BCI)with CLONALG to Amplify Exhibited NeurologicalSignals

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Abstract—Nearly 50 million individuals are diagnosed with neurodegenerative diseases every year. Moreover, this figure is expected to grow as the population grows older. These neurodegenerative diseases have had a profound impact on the neurological functioning of an individual. For instance, being diagnosed with cerebral palsy has been correlated with poor movement and coordination, atypical development patterns, and communication and swallowing difficulties. To help these struggling individuals, scientists have developed a plethora of technologies to assimilate them into day-to-day life. For example, botox injections are commonly used to relieve muscle spasms that have prevented swallowing difficulties. However, these existing treatments have all had disadvantages. For example, botox injections have commonly led to side effects, such as a crooked smile, watery and dry eyes, and flu-like symptoms. Overall, these side effects have disrupted individuals' psychological state, causing renewed calls for better treatments. Fortunately, brain-computer interfaces (BCIs) provide hope for these individuals. For example, to minimize the consequences of cerebral palsy, brain-computer interfaces (BCIs) allow for the usage of remaining muscular pathways as a substitute for paralyzed muscles. This substitution allows for the eyes and hands to have renewed controlover communication devices. In this research paper, we will analyze techniques to optimize the strength of brain- computer interfaces (BCIs) by specifically analyzing how the CLONALG algorithm will enhance the strength of brain- computer interfaces.
Keywords: component, formatting, style, styling, insert (key words).

Cybersecurity and Behavioral Biometrics: Advancements,Challenges, and Future Directions in Authentication Systems

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Abstract—In today's digital landscape, the security of personal and organizational data faces increasing threats from sophisticated cyberattacks. Traditional authentication methods, such as passwords and tokens, are proving insufficient in defending against these evolving threats to improve authentication systems in response, the use of behavioral biometrics has become a viable strategy. Behavioral biometrics leverages unique patterns in human behavior, such as typing rhythm and touchscreen gestures, to continuously verify user identities with high accuracy and minimal user friction. This paper explores the advancements in behavioral biometrics, including the application of machine learning algorithms to analyze and interpret behavioral data. It also examines the challenges, such as privacy concerns and algorithmic reliability that hinder widespread adoption. Furthermore, the paper discusses future directions for authentication systems, envisioning the integration of behavioral biometrics with technologies like artificial intelligence and blockchain to strengthen security and privacy protections. In order to shed illumination for the potential and challenges of using behavioral biometrics to improve cybersecurity measures for people and organizations in the digital age, this paper will analyze these topics in-depth.
Keywords: Behavioral Biometrics, Authentication Systems, Cyber security, Machine Learning, Keystroke Dynamics

AI-Powered Mental Health Assessment using Emotion Detection for Real-Time Analysis

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Abstract—This paper is an AI-driven mental health assessment tailored to each patient's distinct emotional needs, addressing the global mental health crisis. Using advanced machine learning and natural language processing, it aims to deliver personalized guidance for psychological and physical wellness activities, along with tools for tracking individual progress. The papers employ exploratory case studies and knowledge discovery techniques to evaluate the effectiveness of these interventions. Data mining methods reveal hidden patterns within mental health datasets, with the potential to reshape therapeutic paradigms. Expected outcomes include enhanced accessibility to mental health resources, early intervention, personalized progress monitoring, improved quality of life, and reduced stigma. By integrating sophisticated data processing, machine learning, and empathetic user interaction, it operates by redefining mental health support. The system's architecture is designed to promote both emotional and cognitive well-being, fostering positive change in mental health care delivery.
Keywords: Convolution neural network, natural language processing, Machine learning, Emotion detection, conversational bot, Real-Time Analysis, Computer Vision.

Leveraging Machine Learning to Predict Obesity Trends: Insights from Life style and Biometric Data

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Abstract—This is increasingly important as global obesity rates continue to rise: the causes need to be understood, and the ability to predict trends determined. In this study, we use machine learning techniques to predict obesity trends given lifestyle and biometric data from a large obesity dataset. Our methodology starts with data preprocessing that includes transforming categorical variables into numerical variables and standardizes the numerical variables into such a form so that machine learning algo scan work with them properly. Supervised machine learning models, such as tree based methods, neural networks and various ensemble techniques are applied, and evaluated. For determining the most effective predictive approach, these models are evaluated by several performance metrics such as accuracy, precision, recall, and F1 score; the best model is chosen based on these metrics. In addition, the study includes explainable AI technique (SHAP—S Hapley Additive exPlanations; LIME—Local Interpretable Model-Agnostic Explanations) to make the results more interpretable. The results from these methods provide insight into how different lifestyle and biometric factors contribute to the prediction of obesity; such as physical activity, diet patterns, and body mass index. The results from this work demonstrate not only how machine learning can improve prediction accuracy but also how these methods can provide actionable insights into the many contributing factors to obesity.
Keywords:Machine Learning, Obesity Prediction, Explain- able AI, Supervised Learning Models, Feature Selection

Identification of Diabetes Level Using AI/ML Model

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Abstract—Diabetes has become a critical public health challenge due to its alarming prevalence and severe complications. Predictive models are required for early diabetes detection to mitigate the impacts. The present study used K-nearest neighbor algorithm assessment regarding how age, body mass index, blood pressure, and physical activity affect diabetogenic risk. The different health data analyzed prove the effectiveness of K-NN for diagnosing those who are prone to diabetes. The model tries to classify people based on the above-named critical health indicators. Age and body mass index have an above average influence on blood pressure and amount of physical activity according to the K-NN model, thus this model could be used for effective stratification of risk related to diabetes as it scored 0.96. This confirms the utility of K-NN in providing very insightful information for assessing diabetes risk.
Keywords: Diabetes prediction, k-NN algorithm ,health care , Machine learning

Object Detection in Real-Time Surveillance Using Deep Learning-Based YOLO Framework

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Abstract—The degradation of image quality caused by things like light absorption, scattering, and distortion The continual growth of the computer vision and artificial intelligence fields over time has provided the basis for more efficient and accurate surveillance. This paper examines the use of YOLO, a deep learning model used in the detection of objects, for use in real-time surveillance systems. The added benefits of identifying and labeling multiple objects in a single pass forward make YOLO ideal for real-time surveillance. Unlike other approaches to object detection, such as region-based methods or methods with multiple stages of detection, YOLO casts object detection as a regression problem where boxes and class probabilities are predicted jointly. This leads to far improved performance when compared with their slower counterparts without the sacrifice of precision. In this work, the YOLO model is fine-tuned on a large database of surveillance videos to improve object detection at low lighting and in the presence of occlusion and crowding. The developed system has a high detection speed and accuracy; the application areas will include uses such as security inspection, traffic regulation, and anomaly detection. This is done to affirm that using YOLO is more efficient and faster than other object detection algorithms in real-time surveillance tasks. The results indicate directions for further improvements to guarantee public safety and improve efficient surveillance systems.
Keywords: Real-time surveillance, object detection, YOLO framework, deep learning, security monitoring.

Collating Random Forest Classifier and Artificial Neural Networks for the Risk Detection of Maternal Health

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Abstract— This paper compares the performance of ANN models to Random Forests on benchmarking a test dataset against the risk levels of maternal health as low, mid, or high. The features considered are clinical features, namely age, blood pressure, and heart rate. The dataset was imbalanced and needed adapting the ANN architecture by fitting class weights and dropout regularization. The best test accuracy obtained in this fashion was 73%. As the ANN had learned many of the complex data patterns in the dataset, it was, however, still limited by the moderate size and skewness of the dataset. The Random Forest model with grid search produced a much better accuracy of 85.71% compared with ANN, thereby suggesting relatively high generalization across all the classes for better minority risk level classes. An ensemble approach of the Random Forest method appears to better serve toward high accuracy along with interpretability for clinical decision support in maternal health risk assessment.
Keywords: Maternal health, ANN, Random forest, risk, Keras.

Deep Reinforcement Learning for Optimizing Route Planning in Urban Traffic

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Abstract— Urban traffic networks are efficient route design problems due to the intricacy and dynamic character of contemporary cities. Conventional methods hamper real time adjustment to continually changing traffic conditions, thereby providing suboptimal routes, a greater burden on the roadways, and greater air pollution. This thesis presents a novel deep reinforcement learning (DRL) method to optimize the route planning for urban traffic networks. With this rendering of real time traffic data, we use DRL to make autonomous decisions to reduce travel time and congestion of routes. One advantage of using sophisticated neural networks for feature extraction and policy learning is that, since the model is so adaptable to changing traffic patterns, the model guarantees that. And, in comparison to common routing algorithms, the results of simulations using real world traffic data show that this method is able to greatly enhance route efficiency and overall traffic flow management. The suggested DRL based system is feasible as a smart city program based on intelligent transportation system which can scale to grand metropolitan regions. The research presents that DRL can enhance the commuter run experience, reduce the environmental effect, and alter urban transportation. Future study will also investigate how this system can be better optimized when integrated with traffic infrastructure enabled by the Internet of Things.
Keywords: Deep Reinforcement Learning, Route Planning, Urban Traffic, Traffic Optimization, Intelligent Transportation Systems.

Benchmarking Indian E-Commerce Giants: Insights from Festive Sales Performance

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Abstract—This study presents a comparative analysis of the websites of three major e-commerce platforms in India: during the busy shopping sale of Diwali and Navratri. Using metrics derived from Lighthouse audits, the report evaluates the performance, accessibility, SEO, and adherence to best practices of each site. Key factors such as First Contentful Paint (FCP), Largest Contentful Paint (LCP), Speed Index, and overall user experience are examined. The analysis highlights the strengths and areas for improvement of each platform, with recommendations for enhancing load times, user accessibility, and search engine optimization. This comparison aims to provide actionable insights in to optimizing the performance and usability of e-commerce websites.
Keywords: Light house audit, web performance, First Contentful Paint (FCP), Largest Contentful Paint (LCP),Cumulative Layout Shift(CLS), Time to Interactive(TTI)

Deep Learning based Real Time Semantic Segmentation of Autonomous Vehicles

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Abstract—This research presents an innovative navigation framework designed for autonomous vehicles. It integrates ad-vanced deep learning models ResNet50, U-Net, and Efficient- NetB0 to address real-time semantic segmentation challenges in dynamic driving environments. The framework is tailored to enhance the vehicle's capacity to interpret complex surroundings within im al human guidance. The ResNet50 model serves as the primary feature extractor, capturing intricate spatial information from high-resolution camera feeds, which aids in accurately detecting critical elements like lane boundaries, pedestrians, and road signs. U-Net then performs pixel-level segmentation, enabling a detailed understanding of the scene by categorizing each image segment. Efficient NetB0isintegratedto optimize the balance between model precision and computational speed, ensuring real-time performance essential for autonomous driving. This architecture supports robust decision-making capabilities, allowing for precise tasks such as obstacle detection, lane maintenance, and dynamic path planning, even in complex, shifting scenarios. By combining the unique strengths of these models, the framework surpasses the limitations of traditional navigation methods, improving the safety, dependability, and overall efficacy of autonomous systems. The use of advanced semantic segmentation within this approach has the potential to propel autonomous technology forward, enabling more intelligent and adaptive vehicles.

Keywords: Autonomous vehicles, semantic segmentation, ResNet50, U-Net, EfficientNetB0.

Harnessing Tech Innovations for Diversified Multigenerational Work Force and Work Life Balance

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Abstract—This research examines how technologically innovative breakthroughs can assist a multigenerational and heterogeneous workforce in maintaining a healthy work-life balance. It explores how technology can be strategically employed to increase participation rates and address the specific needs of various age groups. The findings reveal how AI-powered personalized learning, collaborative digital communication tools, and flexible remote working solutions foster a healthy and inclusive workplace culture. Additionally, the research emphasizes the importance of leveraging technology in a refined manner to enable all workers to thrive and achieve a sustainable balance between their professional and personal lives.

Keywords:Multigenerational Workforce, Technological Integration, Work-Life Balance, Inclusivity, Flexible Work Solutions, Artificial Intelligence, Personalized Learning, Digital Communication.

Performance Analysis Using Categorical Boosting Classifier (CatBoost), Ensemble Hard Voting Classifier (EHVC) & Convolution Neural Network (CNN) for DNA Sequence Classification

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Abstract—Recently, Machine Learning has become an essential methodology for medical science. Deoxyribonucleic Acid (DNA) carries all the genetic information of every individual. The extraction of features from DNA genetic variations & identifying species are quite difficult without using machine learning and deep learning as it can learn the features automatically. It cannot process the raw data as DNA sequences are represented as the combination of adenine (A), cytosine (C), guanine (G), and thymine (T). The conversion of string data to a tokenized vector is needed as it can be mapped with nucleotides to a numerical token. A k-mer substring of length k hexamer words of size 6 is used here as it is derived from a longer DNA sequence with a combination of ATGC. In this paper, the Categorical Boosting classifier (CatBoost), an ensemble algorithm with hard voting, is proposed with the combination of K-Nearest Neighbors (KNN), Support Vector Machine (SVM), Random Forest (RF) model together to improve the accuracy and robustness of the DNA classification task after vectorization of k hexamer of 6 word sizes. These enable the correctness of medicine, early disease diagnosis, and genomic observation of infectious diseases. The proposed model also integrates the deep learning model, which consists of convolutional neural networks (CNNs), to improve the accuracy and robustness of DNA sequence classification over the CatBoost classifier and the Ensemble hard voting classifier method. Our model accuracy of the ensemble method using hard voting achieved 93%, and the deep learning classifier of CNN achieved 95%.
Keywords:CatBoost Classifier, CNNs, EHVC, K-mer.

Optimization-Based Hyperparameter Tuning Using Extra Trees to Classify Type-2-Diabetes Mellitus

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Abstract—The increasing prevalence of diabetes mellitus (DM) is impacting an ever-growing number of households globally. Many individuals diagnosed with diabetes have limited awareness of their health status and associated risk factors prior to diagnosis. This study introduces a novel approach utilizing Random Forest-based Grid Search Cross Validation (RF GSCV) for hyperparameter tuning, aimed at enhancing classification models for predicting type 2 diabetes mellitus (T2DM). The primary focus of this research is to improve the predictive accuracy of the models and ensure their adaptability across diverse datasets. A dataset consisting of 520 individuals, characterized by various diabetic symptoms, was used to predict the likelihood of developing diabetes, considering both positive and negative probabilities. Optimal parameters were applied to three classification models—Random Forest (RF), XGBoost, and Extra Trees (ET)—to predict diabetes. The models were validated using 10-fold cross-validation, with the Extra Trees model achieving the highest classification accuracy of 97.60%.
Keywords: Diabetes Mellitus, Grid Search Optimization, Classification, Random Forest, Extra Tree Classifier.

Securing the Digital Frontier: An Analysis of Cybersecurity Strategies and Obstacles

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Abstract—In an era where digital connectivity is ubiquitous, the imperative to safeguard cyberspace has never been more pressing. This research delves into the multifaceted landscape of cybersecurity, examining the strategies employed by governments, businesses, and individuals to protect sensitive information and critical infrastructure from cyber threats. By leveraging a mixed-methods approach, which includes a review of existing literature, case studies, and expert interviews, the research provides a nuanced understanding of the cybersecurity ecosystem. Key findings reveal that while technological advancements have bolstered defense mechanisms, including sophisticated malware, advanced persistent threats (APTs), and insider threats, continues to outpace traditional security measures. Moreover, the study underscores the critical role of human factors, such as user error and inadequate training, as significant vulnerabilities. The research concludes with a set of recommendations aimed at enhancing cybersecurity posture, including the adoption of a proactive, adaptive defense strategy, increased investment in cybersecurity education and awareness, and the fostering of international cooperation to combat transnational cybercrime. The insights gleaned from this analysis are intended to inform policymakers, industry leaders, and cybersecurity professionals, equipping them with the knowledge to fortify the digital frontier against evolving threats.
Keywords:Digital defense mechanisms, cyber threats, advanced persistent threats (APTs), critical infrastructure protection, cybersecurity awareness.

RNN Based Optimized Back stepping Controller of Fractional Order Nonlinear System

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Abstract—In this work, a Backstepping controller with Recurrent Neural Network is proposed for reducing the tracking error in the Fractional order nonlinear systems. Further, this paper focuses on the comparison of the proposed control strategy with existing similar approaches. The proposed controller is highly effective in minimizing tracking error when compared to the other controllers like Sliding mode-neuro-fuzzy, Dynamic surface-neuro fuzzy, Artificial Neural network, Event-triggered control, fuzzy-based reinforcement learning and echo state networks with adaptive backstepping controller. The proposed technique is implemented on Genesio-Tesi fractional order nonlinear system. The simulation results presented ensure stability and validate the ability of the controller for regulation and tracking.
Keywords: backstepping controller, recurrent neural network, fractional order nonlinear system, artificial neural network, stability

Leveraging IoT and AI in Precision Agriculture for Efficient Water Management

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Abstract— Where water is limited the challenge of getting the best management of the resource become a major issue in farming. In this study, therefore, we focus on the following question: What role may AI and the IoT play in precision agriculture towards enhancing sustainability through the conservation of water resources? IoT devices that can provide information on the environmental conditions include; sensors for moisture level in the soil, and weather systems. To such data artificial intelligence algorithms are applied to automate the process of irrigation, determine possible water consumption and avoid excess. Real-time and historical data can also be evaluated using machine learning approaches of the system. From this it is then able to predict when crops will need water and then align their irrigation times from this information. Moreover, the analytic model using AI may find potential issues with irrigation and present mitigating steps. Juxtaposing IoT and AI, it is revealed in this research how the two technologies can improve water management decision-making with the aim of minimising water depletion as well as over-irrigation. Integrated soil nutrients management and conservation agriculture are recommended and the overall atmospheric water scarce zone sustainable agricultural productivity is enhanced by the proposed framework while increasing water productivity. The study reveals that it is possible to steer the future of water management through the interconnection of IoT and AI in precision agriculture. It may therefore result in higher production, efficiency in resource utilization and ultimate sustainability.

Keywords: Precision Agriculture, IoT, Artificial Intelligence, Water Management, Predictive Analytics.

Muscle Fatigue Detection Using sEMG Signals for Enhanced Prosthetic Control

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Abstract—This work explores muscle fatigue detection using surface electromyography (sEMG) signals from multiple muscle channels during prolonged load settings. Four vital temporal features, namely Root Mean Square (RMS), Mean Absolute Value (MAV), Waveform Length (WL), and Zero Crossing (ZC), were examined across eight channels to determine the onset and progression of fatigue. The outcomes highlight the benefits of incorporating amplitude and variability-based features to provide robust real-time fatigue monitoring in Myoelectric Control Systems (MEC) and Human-Computer Interaction (HCI) applications.

Keywords:electromyography, muscle fatigue, myoelectric.

A Review on Autism Spectrum Disorder using Machine Learning Approach

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Abstract—Autism Spectrum Disorder (ASD) is a neurodevelopmental condition that presents several challenges, such as difficulty in social communication, repetitive patterns in behavior, and heightened sensory sensitivities. ASD is influenced by several environmental factors, including lifestyle, diet, age, prenatal health, and medications. This condition is more frequently diagnosed in males and poses a higher risk for siblings of children diagnosed with ASD. Early diagnosis of ASD is significantly beneficial for improving outcomes, especially between the ages of 18 and 30 months. Distinct screening tools are available for ASD, such as M-CHAT and CSBS, which help diagnose the condition in young children. On the other hand, tools like ADOS, CARS, and SRS are used for diagnosing older children and adults. Due to delayed diagnosis, several additional challenges may arise, including co-occurring disorders such as anxiety, ADHD, and depression. ASD affects motor skills, language, and social interactions, and individuals often require continuous support for daily activities. Adults with ASD typically face a lower life expectancy due to comorbid conditions. Despite these challenges, early intervention and advancements in diagnostic methods offer hope for better outcomes. A multidisciplinary approach can foster greater independence and integration, improving the quality of life for individuals with ASD.
Keywords:Autism Spectrum Disorder (ASD), Machine Learning, Attention-Deficit/Hyperactivity Disorder (ADHD), Weak X syndrome, Pervasive Developmental Disorder Not Other- wise Specified(PDD-NOS), Diagnostic and Statistical Manual of Mental Disorders-III(DSM-III), DSM-5, Obsessive Compulsive Disorder(OCD).

Factors Influencing the Customer Satisfaction and WOM (Word of Mouth) of Smart Watches: A Perspective of Technology Acceptance Model

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Abstract—The researchers have adopted Technology Acceptance Model (TAM3) to gauze the customer satisfaction level and WOM for smartwatches. The paper intends to examine the factors which influence the adoption intention, customer satisfaction and WOM of smartwatches. TAM3 model was used to validate the primary data comprising of 383 respondents which was further examined by SEM. The findings of the result revealed that motivation and innovation influence the perceived ease of use (PEU). Compatibility and social influence significantly impacted PUF (perceived usefulness). Both PEU and PUF significantly impacted the adoption intention of smartwatches. The adoption intention was positively connected with customer satisfaction which in turn led to word of mouth (WOM) . The study will help the smartwatch manufacturers gain deep insight understanding the factors influencing customer satisfaction and generation of word-of-mouth publicity
Keywords: smartwatches, TAM3, customer satisfaction, word of mouth

Advancing Underwater Image Enhancement Using Hybrid Deep Learning Models

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Abstract— When attempting to make underwater images better, there are a lot of obstacles to overcome, including water's inherent color distortion, inadequate visibility, and light absorption and dispersion noise. The difficulties in accurately analyzing images caused by these problems apply to marine research, underwater robots, and environmental monitoring are only a few areas which are impacted. To address the limitations of existing picture enhancement techniques, this paper proposes a new hybrid deep learning CNN + GAN model for enhancing underwater photographs. The hybrid model extracts features with GANs and noise reduces with CNNs to produce better photos with better clarity and colour correction. I train and validate the model using an underwater picture dataset and it defeats the state of the art approaches on visibility, color correctness, contrast and contrast. In quantitative and qualitative assessments our hybrid deep learning method yields superior generalization in different undersea environments relative to traditional methods. A suggested approach can potentially improve the underwater photography, marine setting data collecting with more precision, as well as better underwater exploration. This work now provides confidence in research progress into autonomous underwater exploration systems and underwater image processing.
Keywords: Underwater image enhancement, deep learning, convolutional neural networks, generative adversarial networks, image processing.

Spectral Reflectance of Indian Ocean Surface to Detect Blue Whales Using VHRS Images.

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Abstract—Protecting blue whales is a core principle of the One-earth Initiative. Accurate detection and classification in oceanic environments are crucial for marine conservation, particularly to avoid mis-classification with other marine objects. Building on our earlier work using Transformer-based models for Detection and tracking of blue whales in the Indian Ocean, this study refines classification accuracy through the application of spectral indices. High-resolution data, obtained from NSIL Bangalore(ISRO) and Planet.com with resolutions of 1.6m and 3m, respectively, is utilized to tackle the complex task of distinguishing blue whales from other marine objects. Statistical Machine learning model are used to validate the detection output accurately by means of whale reflectance data. Mean square error(MSE) is used to check the performance of the prediction .The combined use of these technologies outperformed traditional methods, offering an accuracy of 0.85 and reliability for real-time whale monitoring.
Keywords:Misclassification, Spectral Reflectance, Transformer Models, Spectral Indices, Spectral Bands.

Deep Learning for Precision Medicine: Advancing Personalized Treatment Plans in Oncology

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Abstract— A new approach to cancer care, precision medicine tailors treatments to each patient's specific genetic, molecular, and clinical characteristics. In order to analyse complicated, high-dimensional data and create individualised treatment plans, deep learning a potent subfield of Alhas arisen as a game-changing tool in this area. Discover how deep learning methods are being used in precision oncology to improve cancer diagnosis, prognosis, and treatment planning in this groundbreaking article. A few examples of notable developments are the use of CNNs to medical image tumour identification and segmentation, RNNs to treatment outcome prediction, and LSTM models to patient survival. More effective and less harmful treatments are possible because to deep learning models that integrate multi-modal data, such as genetic sequences, histopathological pictures, and electronic health records. These models can detect new biomarkers and forecast how different medications will affect individual patients. The clinical translation of deep learning models is hindered by a number of obstacles, despite these encouraging improvements. Problems including data scarcity, unequal distribution of classes, and unintelligibility are major roadblocks. Also, to make sure these models are accurate and reliable, they need to be standardised and validated thoroughly before they can be used in clinical processes. Fostering trust and acceptance in therapeutic contexts also requires addressing ethical problems, such as data security, possible biases in algorithmic predictions, and patient privacy. This work offers a thorough analysis of existing approaches, delves into the difficulties and moral concerns, and suggests avenues for further study to improve the use of deep learning in precision oncology. Personalised treatment regimens, made possible by deep learning, have the potential to revolutionise cancer care by vastly increasing patient outcomes.
Keywords:CDSS,EHRs, explainable AI (XAI) Area Under the Curve (AUC), OperatingCharacteristic (ROC)

Analyzing Financial Metrics: A Comparative Study of Salesforce and Microsoft Dynamics 365

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Abstract— The purpose of the study is, therefore, in the integration of six variables consisting of closing prices, daily returns, volatility, stock prices together with moving averages, trading volumes, and their moving averages: how these measure interrelates and what impacts they have toward market sentiment. Correlation and regression tests were carried out to ascertain whether the obtained findings were reliable enough to present robust relationships among the metrics of concern. Therefore, the obtained findings have wider implications for investors, as well as their investing decisions. In the first place, these findings permit one to detail and analyze in an in-depth manner the stock shares' behavior overtime and variations of the market so that trends within trading activity could be unearthed and understood long-term effects.
Keywords: Financial Metrics, Stock Market Analysis, Volatility, Moving Averages, Trading Volumes, etc.

Artificial Intelligence for Irrigation System Optimization Leveraging Predictive Analytics to Enhance Water Management and Decrease Agricultural Resource Consumption

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Abstract— Irrigation system optimization is of utmost importance for sustainable agriculture in light of the growing worldwide water shortage caused by climate change and rising agricultural needs. In order to improve water management techniques and decrease agricultural resource use, this project investigates the use of AI and predictive analytics. An intelligent irrigation system that adapts water distribution in real-time according to predictive analytics is created in this study by combining state-of-the-art machine learning algorithms with real-time data from a variety of sources, such as weather predictions, soil moisture levels, and crop water needs. In order to reduce water waste and maximize irrigation efficiency, the suggested framework uses past data to train artificial intelligence models. Results from field studies on a variety of crops show that water efficiency has been improved, allowing for 30% reductions in irrigation water use without sacrificing or diminishing crop yields. Sustainable farming practices and better resource management are two additional benefits that farmers reap from using AI-driven insights to inform their decision-making. This research emphasizes the revolutionary power of AI to update irrigation methods, leading to more robust agricultural systems. This study highlights the significance of data-driven methods to water management in achieving food security and environmental sustainability through the integration of technology and agriculture. If we want to see optimal irrigation practices adopted all throughout the world, our next step is to improve the predictive models and make the framework function in more diverse agricultural settings.

Keywords:Irrigation System Optimization, Predictive Analytics, Water Management, Agricultural Resource Management, Smart Irrigation, Precision Agriculture.

Fabrication of Sensors less Automated Guided Vehicle for Small Warehouse Rack Management

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Abstract— Automated guided vehicles (AGVs) are an essential part of today's logistics networks because they save time, reduce wear and maintenance expenses, and maximize efficiency in route design. The creation of AGV that is capable of effectively managing warehouse racks without the utilization of sensors is the primary emphasis of this project. In order to travel and carry out duties, the AGV runs on predetermined pathways and makes use of a button-based interface. For the purpose of offering an efficient and cost-effective solution for the automation of small warehouses, it is outfitted with a lever mechanism that is operated by a servo motor and features the ability to connect and move racks.

Keywords:AGV, Sensorless, style, styling, insert.

Enhancing Software Vulnerability Detection Using Code Property Graphs and Convolutional Neural Networks

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Abstract—The increasing complexity of modern software systems has led to a rise in vulnerabilities that malicious actors can exploit. Traditional methods of vulnerability detection, such as static and dynamic analysis, have limitations in scalability and automation. This paper proposes a novel approach to detecting software vulnerabilities using a combination of code property graphs and machine learning techniques. By leveraging code property graphs, which integrate abstract syntax trees, control flow graphs, and program dependency graphs, we achieve a detailed representation of software code that enhances the accuracy and granularity of vulnerability detection. We introduce various neural network models, including convolutional neural networks adapted for graph data, to process these representations. Our approach provides a scalable and automated solution for vulnerability detection, addressing the shortcomings of existing methods. We also present a newly generated dataset labeled with function-level vulnerability types sourced from open-source repositories. Our contributions include a methodology for transforming software code into code property graphs, the implementation of a convolutional neural network model for graph data, and the creation of a comprehensive dataset for training and evaluation. This work lays the foundation for more effective and efficient vulnerability detection in complex software systems.

Keywords: Graph Neural Networks(GNNs),Abstract Syntax Trees(ASTs),Control Flow Graphs(CFGs),Program Dependency Graphs (PDGs),Code Property Graphs(CPG),Patchy-SAN Framework,Graph Attention Networks (GATs)

Exploring the Adoption of Wearable Technologies by Employees of Ed Tech Sector and its Impact on Productivity: A Perspective through the Theory of Gratification

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Abstract—The researchers have utilized the Theory of Gratification as a framework to gauge the adoption intention and hence the impact on productivity by embracing wearable technologies by the employees of Ed Tech sector. The proposed theoretical model has highlighted the impact of Workplace safety (WPS), Curiosity (CUR), Convenience (CON), Social Influence (SOI) and Trialability (TRB) on Adoption Intention (ADI) and productivity of employees. Moderating impact of Trust on the above-mentioned factors have also been validated by using SPSS and AMOS. Theory of Gratification has corroborated the primary responses collected from the employees of Ed Tech sector pertaining in the Bangalore region (n=377). The results arrived at by using Structural Equation Model (SEM) analysis suggest that there exists a significant positive relationship between ADI & WPS, ADI & CUR, ADI & CON, ADI & SOI, ADI & TRI. The moderation results signify that trust moderates the relationship between WPS & ADI, Con & ADI. This study will facilitate the Education sector to arrive at informed decision-making and embrace new technology for the wellbeing of its employees.

Keywords: Wearable Technology, Theory of Gratification, Ed Tech sector, Adoption Intention, Productivity

IoT-Based Liquid Level Monitoring and Control System for Industrial Applications

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Abstract—Storage vessels play a crucial role in the chemical industry by accommodating a wide range of solvents, including those that are toxic, volatile, or hazardous. It is essential for process engineers to maintain optimal liquid levels for various unit operations, making continuous fluid level monitoring a necessity. Failure to monitor the liquid level in a tank appropriately can lead to spills and potentially dangerous accidents. Inadequate liquid levels can also result in vessel damage and operational disruptions. In this study, we have developed a real-time liquid level monitoring system that calculates and transmits data to a remote server via a wireless network. This IoT-based monitoring system is constructed using components such as the ESP32 microcontroller, HC-SR04 ultrasonic sensor module, LCD display, and motor driver unit. This system sends real-time data to a central server, allowing multiple users to access the current level and quantity of chemicals or solvents. Furthermore, our system offers remote valve control capabilities through IoT technology, enabling users to open or close inlet and outlet valves remotely, and even automate these actions. This work provides significant benefits to process engineers, as it offers live updates on liquid levels, which can be conveniently accessed from their workstations or mobile devices, enhancing safety and efficiency in chemical industry operations.

Keywords:Internet of Things, ESP32, Ultrasonic waves, Hazardous chemicals.

Wheel-Parker: Real-time Parking Space Allocation and Management

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Abstract— Parking has become a significant challenge in urban areas due to the increasing number of vehicles and limited spaces. Drivers often waste time and money searching for parking, which leads to traffic congestion. To address this, a prototype utilizing IoT, RFID, and IR sensors was developed. RFID captures vehicle details, IR sensors detect vehicle presence, and IoT enables remote access to parking data. The system provides real-time availability, supports advance booking, and includes theft detection. It enhances flexibility and security, making it ideal for large venues like airports and multiplexes, with minimal human intervention.

Keywords: Radio Frequency Identification (RFID), infraredsensor (IR), Internet of Things (IoT)

ADASYN: Oversampling Techniques for COVID-19 Prediction

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Abstract—In 2019, the highly contagious COVID-19 virus emerged and rapidly spread, causing a global health crisis characterized by inflammatory respiratory symptoms. The primary target of this disease is the respiratory system. Research has identified bats as the reservoir for the virus, but the intermediate host remains unknown. There is ongoing concern about various coronavirus variants, with the Omicron variant previously dominating globally and now attention shifting to a new variant, BA.2.86, informally known as Pirola, which is being closely monitored worldwide. However, the inherent class imbalance in COVID-19 datasets poses a significant obstacle to the effectiveness of these models. This paper proposes a novel approach combining outlier detection and Adaptive Synthetic Minority Oversampling Technique (ADASYNA) to address this issue. The Outlier-ADASYNA method identifies outliers within the minority class (COVID-19 cases) and synthesizes informative samples to rebalance the dataset.The proposed approach is evaluated using data from 5,400 patient records for both training and testing. The study employs ADASYN to effectively mitigate dataset imbalances and outstanding traditional oversampling techniques. The paper achieves a comprehensive comparison of machine learning models, evaluating their performance using various metrics. The Random Forest classification algorithm attains the highest accuracy percentage of 90%, and RF Oversampling 92% surpassing numerous classification algorithms in predictive performance.
Keywords: COVID-19,ADASYN, Oversampling, SMOTE, Imbalanced Dataset.

Improving Threat Detection in Airport Security Inspections with X-ray Image Enhancement

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Abstract—Security at airports is critically dependent on the accurate detection of potential threats through X-ray image analysis. However, traditional methods can be hindered by issues such as image noise, poor contrast, and resolution limitations, which impact the effectiveness of threat detection. To address these challenges, this project focuses on enhancing threat detection by applying advanced X-ray image processing techniques combined with deep learning. Specifically, the project employs the MobileNet algorithm, a cutting-edge convolutional neural network to enhance the classification and object identification identification of objects in X-ray images. MobileNet's lightweight architecture and robust performance in image analysis make it an ideal choice for this task, enabling detailed and efficient processing of X-ray images. The model is trained on a diverse dataset of X-ray images, capturing a wide range of potential threats and objects. By improving the clarity and detail of X-ray images and leveraging MobileNet's advanced detection capabilities, the system aims to enhance the accuracy and reliability of threat identification. The performance of the MobileNet-based approach is rigorously tested and compared to existing methods, demonstrating significant improvements in detection accuracy and efficiency. This innovative solution aims to support security personnel in making more informed and timely decisions, ultimately contributing to enhanced airport security and passenger safety.
Keywords: Security at airports, X-ray image, MobileNet, accuracy

Multiple Slip influence on Maxwell fluid flow around a porous vertical cone with addition of nanofluid particles: MHD and Convective boundary condition

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Abstract— When Brownian motion is present in a non-Newtonian Maxwell-nanofluid flowing through a vertical cone filled with porous material, the authors used numerical solutions to probe the mixed impacts of unique slip effects, thermal radiation, mass transfer, and heat change characteristics. This was done in order to find out the mixed influences of Brownian motion. They discovered that flow of a non-Newtonian Maxwell-nanofluid influenced these characteristics. When the researchers analyzed the process that happens when a vertical cone becomes immerse in a porous condition, they took into account concentration slip boundary conditions, velocity, convective boundary conditions, heat and mass change, thermophoresis, and a magnetic field. A model compose of a collection of nonlinear governing partial differential equation (PDE) subject to boundary condition is use to offer a quantitative description of the underlying physical state. The Keller box method is use to solve differential equation with well-defined boundary condition numerically. The exact outcomes will be displayed in the form of a graph to demonstrate how the temperature, concentration, and speed are affected by changes in the controlling factors. According to this point of view, the presence of these components has a substantial effect on several technical applications, such as the production of polymers, metal layers, paper sheets, nuclear reactor cores, and sectors related to biotechnology. The computational findings are backed up by a comparison of individual instances from the current research to those from earlier investigations, which reveal a high level of concordance among the both sets of data. Because of this, we are able to go on with the computational analysis that is required for this assignment.

Keywords: Two-dimensional, Maxwell fluid, Nanofluid, MHD, Convective boundary condition, Vertical Cone, Porous medium, Numerical solutions.

Systolic Array Design for Efficient FPGA Implementation of CNN Accelerators: Power and Area Optimizations

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Abstract—Convolutional Neural Networks (CNNs) are widely used in image processing, object detection, and other machine learning applications due to their ability to extract features from data effectively. However, the high computational and memory demands of CNNs pose significant challenges for real time applications, especially in resource constrained environments such as edge devices where power consumption is a critical factor. This project proposes the design and implementation of a power efficient heterogeneous systolic array architecture integrated with low power techniques to accelerate CNN operations. The design aims to optimize resource utilization and throughput while reducing power consumption. By leveraging specialized processing elements (PEs) and efficient dataflow methods, the proposed architecture seeks to achieve substantial improvements in power efficiency and performance compared to traditional systolic arrays.

Keywords**:** Heterogeneous systolic arrays, power efficiency, edge computing, dynamic power management.

RF and IoT-Driven Automated Lane Clearance System for Enhanced Emergency Response

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Abstract—In urban areas, traffic congestion often causes significant delays in emergency response times, potentially jeopardizing lives. This project proposes an Automatic Lane Clearance System specifically designed to facilitate the swift movement of ambulances through traffic. The system employs a combination of IoT and RF-based technologies, enabling real-time communication between ambulances, nearby vehicles, and traffic signal infrastructure. The ambulance unit is equipped with an Arduino microcontroller, RF transmitter, Node MCU (ESP8266) for Wi-Fi communication, and an LCD display. The system utilizes UBIDOTS as the IoT platform for data logging and monitoring, powered by a dedicated battery supply to ensure continuous operation. When an ambulance approaches a high-traffic area, the RF transmitter signals nearby vehicles, equipped with RF receivers and Arduino microcontrollers, to clear a path. Simultaneously, the system communicates with the traffic signal infrastructure via Node MCU, triggering the traffic lights to display a green signal for the ambulance route. Additionally, a buzzer alert is activated at the traffic signal to notify pedestrians and other vehicles of the emergency situation. This automated lane clearance system aims to reduce response time by ensuring that ambulances encounter minimal resistance in their path. By utilizing an efficient communication protocol across multiple traffic entities, the system promises a reliable and scalable solution for emergency traffic management in smart city initiatives.

Keywords: Automatic Lane Clearance, Emergency Response, Ambulance Priority System, Traffic Signal Control, IoT in Traffic Management, Arduino Microcontroller, RF Communication, Node MCU ESP8266 etc.

Wearable Temperature Detection System for Personalised Health Tracking

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Abstract— The health of a human being is indicated by various vitals like heart rate, blood pressure, respiration rate, and body temperature, to name a few. An accurate measure of temperature is an essential parameter while monitoring temperature in critical conditions, especially for frontline workers, where continuous temperature measurement is of prime importance. This work analyses temperature sensors and explores various testing methods for response time and methods to improve the parameters. A customised PCB and temperature sensors were designed, fabricated, and tested. A custom-made Android app was also developed and tested to visualise the data from the sensors. The test results showed that the system developed has a quick response time of 4 to 6 seconds for a temperature change of 65°C and complies with military standards set by DRDO.

Keywords: Healthcare Device, Microclimate Garment, Temperature Regulation, Thermocouple, Wearable Device

Advanced Wearable Technology For Upper Limb Rehabilitation In Post-Stroke Survivors

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Abstract—Stroke is a leading cause of disability, often leaving survivors with impaired upper limb function, which hinders their daily activities. This method revolutionizes the rehabilitation process for stroke survivors by developing a wearable device. Traditional rehabilitation methods, while effective, are often time-consuming, costly, and require frequent visits to therapy centers. This device aims to address these limitations by integrating advanced wearable technology into the rehabilitation process. The wearable device will be designed to monitor the user's muscle activity, movement patterns, and range of motion in real-time. It will provide personalized feedback to healthcare professionals and caregivers, allowing for continuous rehabilitation. The device will also feature elements to enhance user engagement, motivation, and compliance with therapy regimens. Additionally, the collected data will be used to create a comprehensive profile of the patient's progress, enabling healthcare professionals to tailor treatment plans more effectively. The integration of AI-driven algorithms will further refine the rehabilitation process by predicting and adapting to the patient's evolving needs. This device not only promises to enhance the effectiveness of upper limb rehabilitation for post-stroke survivors but also aims to reduce healthcare costs and improve the overall quality of life for patients. By making rehabilitation more accessible, engaging, and personalized, this advanced wearable technology has the potential to transform stroke recovery on a global scale.
Keywords:Wearable technology, Rehabilitation, Stroke survivors, Muscle activity monitoring, AI-driven algorithms.

Comparative Analysis of Traditional and Ensemble Learning Models for Network Security System

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Abstract—In this paper use CIC-IDS2017 dataset to illustrate a comparative analysis of traditional and proposed models for intrusion detection in network security systems. The comparison includes DT, RF, ET and XGBoost classifiers. Normalize class, SMOTE Data preprocessing to compensate for missing values and of imbalance classes From the results of evaluation metrics, we conclude that proposed methods show a significant improvement on its model performances in detecting network intrusions as compared to traditional models XGboost specifically this work. Out of all the algorithms, the accuracy for XGBoost stands out, as it is mostly known to cater to complex attack patterns. The results indicate that ensemble base techniques offer the best solutions which can prove to be both effective and efficient as an intrusion detection systems for current network technologies.
Keywords:Intrusion Detection, Ensemble Learning, XGBoost, Random Forest, Network Security, CIC-IDS2017

AI for Smart Farming: Machine Learning Models for Precision Crop Yield Prediction

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Abstract— AI and other advanced technologies are gradually beginning to invade the agriculture sector to serve the increasing demand of the consumers for better methods of food production. A key component of precision agriculture, this work focuses on how to use machine learning models to predict crop yields with high accuracy. Specifically, the nature and volatility of the environmental context – such as the nature and quality of soils, as well as the climatic and water conditions – present a major challenge to the application of the conventional modeling approaches aimed at forecasting productive capacity in agriculture. Still, when comparing, the AI-driven models will allow sorting through much information gathered from different sources, including sensors, satellite imagery, and yield history. This work examines the differences of several machine learning models. Such models are the Random Forests, SVMs, and CNNs and other Deep Learning methodologies respectively. A quality model is evaluated based on scalability, computational performance, and prediction accuracy. Also in scope of the study, there is an opportunity to employ IoT together with data collected with remote sensing to make and provide real-time forecasts and evaluations. By the utilization of the results attained, it is established that the yields expected by the machine learning models are much more precise, which aids in enhancing agricultural decision-making concerning resource utilizing, crop handling, and risk minimization. The purpose of this study is focused on the promotion of the agricultural sustainability and production through the development of the innovative data driven farming practices.

Keywords: Precision agriculture, crop yield prediction, machine learning, smart farming, remote sensing.

End-User-Centric Cloud Security: An Integrated Approach for File Encryption and Decryption with Blowfish and AWS

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Abstract— With the growing trend of cloud computing, the necessity for secure data storage arises as traditional security measures fail with different types of new emerging cyber threats. The paper introduces a file storage system that maintains secure data confidentiality and integrity in the cloud environment using Blowfish encryption. File upload will now allow a user to encrypt and store files for decryption purposes only by authorized users with their encryption keys. Key functionalities will include strong authentication of users, file encryption, and key management according to secure management-all housed within a cloud infrastructure-AWS. This also serves to aid in multiple host systems access, hence scalable and reliable.

Keywords: Blowfish Algorithm, Cloud Computing, File Encryption, Data Security, Symmetric Encryption, User Authentication, Key Management, AWS (Amazon Web Services), Secure File Storage, Scalability, Cloud Infrastructure

Improving Accuracy of Object Detection in Autonomous Drones with Convolutional Neural Networks

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Abstract—Increasing use of autonomous drones in areas such as agriculture, disaster response, and surveillance highlights the growing importance of effective and precise object recognition methods. This study employs Convolutional Neural Networks (CNNs) to enhance the precision of autonomous drone object detection systems. While conventional machine learning approaches struggle in handling complex contexts and real-time processing, CNNs have successfully managed visual identification tasks. Utilizing state-of-the-art techniques like data augmentation and transfer learning, combined with real-time data augmentation on edge processors, this research introduces a fine-tuned CNN model designed for drones. The model is trained and tested on a large dataset of aerial photos captured by drones, with item classification influenced by factors like lighting conditions and weather variables. Experimental findings demonstrate a significant improvement in object detection accuracy, reducing false positives and enhancing resilience in dynamic environments. Additionally, the proposed model supports detection with minimal latency, making it ideal for real-time drone deployment. This work not only advances autonomous drone navigation but also shows great potential for applications such as environmental monitoring, search and rescue (SAR), and precision agriculture. Research continues on the scalability of the model components and their performance on hardware with limited resources.
Keywords: Autonomous drones, object detection, Convolutional Neural Networks, real-time processing, precision agriculture.

Accelerating Efficient Adsorption EnergyCalculations Using Machine Learning

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Abstract—Design of catalysis is important for various sustainable purposes like enhancing reaction rates in industrial process, improving the overall yield of desired products, reducing harmful emissions in chemical manufacturing. Adsorption energy plays major role in understanding strength of catalyst by analysing reaction mechanism at molecular level. In this research adsorbML algorithm is used to identify low-energy adsorbate-surface configurations more accurately and efficiently. It uses fc100 dataset for catalyst analysis. This study demonstrates the low energy adsorbate-surface configurations of Au and Ni alloys by using ASE, LFGBS, algorithms for finding force values, and show the relaxation process over time. From this analysis Ni and Au adsorption energy is 2.28 eV and 2.00 eV at 100 and 79th step. Similarly the minimum binding energy (adsorption energy) for any adsorbate-surface combination is found using this adsorbML algorithm.
Keywords:Machine Learning, Adsorption Energy, fc100, adsorbML, Chemical manufacturing

Advances in Big Data and Data Mining: Techniques and Applications in Data Fusion for Enhanced Insights and Decision-Making

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Abstract— The advancement of big data has accelerated over the years to change how companies utilize data to drive decisions. And so this paper aims to look at big data and data mining in different perspectives while highlighting the importance of data fusion in decision making in the current society. Many times, data fusion combines different data sources to provide better and broader results. Clustering of raw data, anomaly detection and machine learning are discussed as well as their use in healthcare, financial management and smart cities. This paper also presents such issues as data heterogeneity, data quality assurance, as well as scalability issues. Lastly, tomorrow's possibilities, such as artificial intelligence and quantum computing, are presented as possible enhancements of the data fusion effectiveness are mentioned due to the expected marked advancement in real-time and adaptive decision-making systems.

Keywords: Big Data Analytics, Data Mining Techniques, Data Fusion, Artificial Intelligence, Predictive Modeling, Real-Time Data Processing.

Enhancing Career Development: An AI-Driven Mentorship Platform forStudent-Mentor Connections

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Abstract— Thunai is an AI-powered mentorship platform that connects users with personalized mentors for career guidance. Key features include automated calendar booking, video communication with privacy-enhancing dynamic emojis, and AI-driven mentor matching aligned with mentee goals. The AI assistant, GURU, supports task management, resource recommendations, and LinkedIn-based evaluations to foster growth. Thunai offers subscription plans and partnerships with educational and mental health organizations, enhancing engagement, leadership development, and networking. Leveraging AI technologies like sentiment analysis and feedback, Thunai improves mentor matching, user satisfaction, and mentee engagement for career and emotional well-being.

Keywords: AI-powered mentorship, career guidance, mentor matching, emotional well-being, task management, sentiment analysis, professional growth

A Context for Human Behavior Recognition Using Facial Expression

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Abstract—-Human beings are born to show facial expressions, and this is the only behavior that identifies the specialty of a human being. This feature of humans makes him unique and expressive to handle different situations in real life. Even this feature of human beings makes him attractive and expressive. Doctors identify the psychiatric patient based on their facial expressions. The happiness, sadness, fear, anger are some major expressions given by human beings, when faces specific situations. This paper gives Facial Expression Recognition (FER) system which plays a pivotal role in enabling computers to understand human behaviorthroughtheanalysisoffacialexpressions.Inthisresearchpaper, a journey is to enhance FER systems are shown by lever aging advanced algorithms and methodologies. The purpose of this work is to enhance the accuracy and performance of FER models, there by facilitating more empathetic and natural interactions between humans and machines. This work delves into the technical intricacies of FER, exploring innovative approaches such as convolutional neural networks and recurrent neural net works to decipher facial cues and recognize emotions moreaccurately.Additionally,challengesrelatedtodatasetdiversity,real-worldd employment, ethical considerations, and user experience, striving to create FER systems are identified that are not only technologically proficient but also respectful of individual privacy and cultural diversity. Through this research, the aim to pave the way for more empathetic and inclusive human-computer inter actions, ultimately contributing to a future where technology enhance sourunder standing of emotions and strengthens human connections. It gives 79.2% better results than the previously proposed systems. This work could be effective in the field of medical, crime detection and other investigations systems too, this could be a drastic revolution to identify pain, happiness and other features using computers in the future.
Keywords:Face recognition, machine learning, deep learning, human behavior analysis, computer vision

The Comprehensive Review of Different Categories, Applications, and Methods Used In Healthcare Recommender System

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Abstract—Nowadays, in the digital world, healthcare stands out as one of the most prominent domains in the health field. A healthcare system (HS) is essential for studying a vast quantity of patient records, aiding in deriving insights and assisting in the prediction of diseases. The Healthcare Recommendation System (HRS) is emerging as a vital platform for medical services. This review article provides a comprehensive analysis of existing recommendation methods, including content-based, collaborative, hybrid, etc. The main focus of the article is to offer a review of Recommender Systems (RS) in healthcare. It delves into distinct methods used for healthcare RSs, such as clustering-based, regression, and classification-based methods like CNN, SVD, etc. Existing classification-based HRS methods have achieved the maximum accuracy rate compared to other methods.
Keywords:Healthcare recommendation system (HRS), recommender system (RS),Convolutional neural network (CNN), Singular valued decomposition, and Recommendation (content, collaborative, and hybrid) methods.

Strategic Blended Learning for Addressing Multiclass Imbalance in Classification

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Abstract— Numerous practical applications involve multiclass classification challenges, where the distribution of data among classes is frequently uneven. Due to this inherent data imbalance, supervised learning models often exhibit a bias toward classifying instances into the category with the highest number of data points, posing a significant problem that requires attention. In the realm of classification of data with multiple classes and imbalanced distributions, researchers in machine learning persistently endeavor to mitigate the classifier's inclination toward the dominant class with more sample size. Existing studies aim to alleviate this inclination by alternatively adjusting the data for balance prior to the classifier's learning process, adjusting the classifier's training process to focus more on rare classes having the least number of samples, or employing hybrid strategies. Existing learning approaches encounter challenges in delineating clear boundaries between samples of classes resulting from an imbalanced class distribution and issues with class overlapping. Consequently, the recognition rate for minority classes is hindered. A novel Strategic Blended Learning (SBL) approach is introduced, employing dual decision trees. The first decision tree is utilized to generate an induced dataset through a grouping approach, while the second decision tree is employed to learn and make predictions based on the induced dataset. A noteworthy aspect of this algorithmic approach is its ability to identify rare data points without affecting the inherent distribution of data.To evaluate the proposed algorithm, various multiclass imbalanced datasets from UCI were employed for classification. The findings revealed that the Strategic Blended Learning method excels in detecting both rare and dominant class samples.

Keywords:Multi class imbalance classification, dominant class, rare class, LDA, K-Means, Decision Tree

Computing Midcurve with Multi-layer and Convolutional Neural Networks

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Abstract—Midcurve computation: the dimension reduction of 2D thin polygon shapes to 1D curves is important for several Computer-Aided Design (CAD) and Computer-Aided Engineering (CAE) applications, particularly in finite element analysis and robot path planning. We advance the state-of-the-art by building on previous work on Midcurve NN, through two new neural architectures: a multi-layer dense network and a CNN-based architecture with skip connections. Through comparative analysis, we demonstrate that while the dense network shows limited improvements, the CNN-based architecture with skip connections achieves a tenfold reduction in average loss compared to existing methods. The proposed approach improves the quality of the generated Midcurves.

Keywords**:**Mid-curve computation, dimension reduction, convolutional neural networks, dense neural networks

A Novel Deep Learning Model Based Lung Cancer Detection of Histopatho logical Images

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Abstract— Lung cancer is still one of the world's top causes of death, and increasing survival rates require early identification. Biopsied tissue must be histopathologically analyzed for diagnosis; however, manual inspection can be laborious and error-prone, increasing the possibility of a mistake and inappropriate therapy. This study examines how well several deep learning models—EfficientNetB0, ResNet50, VGG19, VGG16, and InceptionV3—classify lung tissue into three categories: benign, malignant, and normal.InceptionV3 (81%), VGG19 (94%), VGG16 (90%), ResNet50 (95%), and the EfficientNetB0 model (98%) all had the highest accuracy. Through highly accurate cancer categorization automation, these models promise to improve diagnostic efficiency, reduce pathologists' workload, and minimize errors. Developing dependable computer-aided diagnostic systems is supported by the comparative assessment of various architectures, which guarantees optimal performance. To improve patient outcomes, this work offers insightful information for future developments in deep learning systems for lung cancer detection

Keywords: EfficientNetB0, ResNet50, VGG19, VGG16, InceptionV3, Histopathological Image, Lung Cancer, Cancer Classification, and Computer-Aided Diagnosis.

Self-Supervised Learning: The Core of Next-Gen Machine Learning and a Paradigm Shift in AI

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Abstract—Self-supervised learning (SSL) commands advance tutoring models beyond the need of wide labeled data, making it scarce for fields with restricted annotated resources, like computer vision, NLP, remote sensing, and imaging in the field of medicals. By manipulating pseudo-labels from pretext tasks, SSL methods have drawn attention for their advancements like image classification and even object detection. This study aims to draw light on contrastive SSL, which acquires the knowledge robustly, invariant features with data transformations, refining model resilience to adversarial perturbations and labeled noises. The Self-Supervised Semi-Supervised Learning (SSL) framework which accumulates SSL with Semi-Supervised techniques, is known for its effectiveness through high-performance models with small labeled Implementations in remote sensing and medical imaging SSL's verbalities and abstraction across domains. This study scrutinizes SSL strategies, examines performance benchmarks, and recognizes future research directions for applicability. upgrading robustness and SSL promises well-regulated and multi-skilled learning with nominal labeled data required.

Keywords:Self-supervised learning, contrastive learning, semi-supervised learning, robustness, adversarial perturbations, data augmentation, pretext tasks, model architecture.

Comprehensive Survey of Post-Quantum Secure Lattice-Based Authentication Schemes for VANETs

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Abstract—Intelligent Transportation Systems (ITS) rely heavily on Vehicular Ad Hoc Networks (VANETs) to enable secure and reliable communication between vehicles and roadside infrastructure. However, Shor's algorithm poses a significant threat to conventional cryptographic systems. To counteract this threat, post-quantum cryptography offers quantum-resistant solutions capable of providing secure authentication in the face of quantum adversaries. This paper presents a comprehensive survey of recently proposed six post-quantum state-of-the-art authentication protocols designed to meet the security and performance demands of VANETs. The survey identifies key strengths and limitations in existing approaches, providing valuable insights to guide future research in designing robust, efficient, and quantum-resistant authentication mechanisms for next-generation vehicular networks.
Keywords: Vehicular ad hoc Network; Autonomous Vehicle; Secure communication; Quantum-Resistant Schemes; Lattice-based cryptography.

AI in Medical Imaging: EnhancingDiagnostic Accuracy with DeepConvolutional Networks

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Abstract— The past has witnessed a time of astounding developments in AI, particularly notable deep convolutional networks, which has greatly facilitated medical imaging by opening up previously unattainable doors for both precision and effectiveness of diagnoses. This study is an investigation into how deep convolutional neural networks (CNNs) might be applied (using MRI, CT, and X-ray as examples) to medical imaging for the purposes of improving accuracy, consistency, and practicability of diagnostic procedures. Through automated feature extraction and categorisation, convolutional neural networks (CNNs) enable earlier, and more accurate, detection of illnesses such as cancer, cardiovascular disease and neurological problems by detecting minor deviations that humans may miss. Here we evaluate the accuracy, sensitivity, and computing efficiency of several convolutional network (CNN) designs. ResNet and U-Net are these architectures. The results indicate that CNN based models provide better performance compared to conventional diagnostic approaches with a substantial diminution in both false positives and false negatives. The article also covers combining CNNs with others AI methods such as transfer learning, ensemble methods, etc. to further improve diagnostic results. Although the encouraging outcomes, data protection, interpretability, and clinical acceptance continue to be obstacles. This study shows how AI driven technology can revolutionise medical imaging to enhance patient outcomes as well as tailored healthcare solutions.
Keywords: (CNN), MRI, CT, ResNet,U-Net, Grad-CAM, GPUs TPU, VGGNet, SHAP

Electric Vehicle Charging Infrastructure and Dc-Dc Converter ControlTowards Sustainable Transportation

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Abstract— The rise of electric vehicles (EVs) has marked a significant shift towards sustainable transportation, necessitating the development of robust charging infrastructure and efficient power management systems. This paper explores the pivotal role of electric vehicle charging infrastructure in facilitating widespread EV adoption and examines challenges such as grid capacity constraints and interoperability standards. Additionally, it delves into the role of DC-DC converters in optimizing power flow and efficiency in EV charging systems. By harnessing renewable energy sources like solar and wind, eco-friendly charging stations offer a promising solution to reduce greenhouse gas emissions while meeting the escalating demand for EV charging. Through innovation and strategic policy initiatives, the electrification of transportation holds the promise of reshaping urban landscapes and paving the way towards a more sustainable future.

Keywords: Electric vehicles, charging infrastructure, sustainable transportation, DC-DC converters, renewable energy, grid capacity, interoperability standards.

Leveraging Machine Learning for Early Detection of Cardiovascular Diseases

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Abstract— In order to enhance patient outcomes, rapid and precise detection approaches are needed for cardiovascular diseases (CVDs), which are among the top causes of death globally. By examining a wide range of demographic and clinical data, this study investigates how machine learning approaches could improve the early diagnosis of CVDs. We explore how many different machine learning methods could identify different heart diseases. Decision trees, support vector machines and more, are included in these algorithms. By using feature selection and optimization methods we want to strengthen these models' prediction abilities and make them more resilient. The dataset used by this research includes all of the medical information of patients as they include all the pertinent biomarkers such as age, blood pressure, cholesterol levels and etc. The results suggest that machine learning models, especially ensemble methods like Random Forest and gradient boosting, are indeed able to predict the risk of CVD better than conventional diagnostic strategies. Results suggest that early risk assessment using machine learning embedded within healthcare processes is a reliable and non-invasive approach. This study has found machine learning to have promise for change and further research into the practical use of these models to revolutionize treatment of cardiovascular diseases.

Keywords:Convolutional Neural Networks (CNN),Recurrent Neural Networks (RNN),Long Short-Term Memory (LSTM),Electrocardiogram (ECG), Cardiovascular Diseases (CVD),Support Vector Machines (SVM)

Real-Time Sign Language Detection using Deep Learning

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Abstract—Sign language is the primary mode of communication for deaf and hard of hearing community. This paper discusses the development of a real time sign language recognition system by deploying deep learning techniques. For instance, the aim is to establish a good model which could be used to identify different hand gestures as used in sign languages. Once trained on a data set of 10 different hand gestures, the system is able to recognize and predict gestures in other images. The use of TensorFlow and Keras in the implementation ensures scalability of the system for real-time application. This method aims at assisting the deaf and mute people by developing an application that will improve their social life. Furthermore, TensorFlow and Python facilitate the porting of the system to mobile and embedded systems, which enhance its reach among different gadgets. This system is intended to help avoid one of the main concerns of sign language users in which they have limited ability to interact with others and thus limited engagement with basic services. The objective of the researcher is to make the quality of life of sign language users better by translating their gestures into a format that is easier to understand.

Keywords:Sign Language, Deep Learning, Gesture Recognition,Tensorflow, keras, Embedded Platform.

Development of Assistance System for Online Dispute Resolution and Legal Advice using AIML

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Abstract— In the present work, the main goal is to reduce the downsides of litigation and other traditional conflict resolution procedures. Many people and corporations avoid litigation due to its high costs, extended timelines, and mental stress. This methodology presents a fresh perspective on conflict resolution, one that makes use of technology to simplify the process and provides an affordable and easily accessible option. At the heart of this strategy is an Online Dispute Resolution (ODR) platform that allows for the digital resolution of disputes, doing away with the necessity for physical presence and the expenses that come along with it. Everyone from sole proprietors to large corporations, regardless of their level of legal knowledge, may utilize the platform because to its intuitive design. Eventually, this initiative seeks to enable individuals and companies to confidently and easily manage legal difficulties by reshaping the landscape of legal dispute resolution with an emphasis on speed, accessibility, and openness. Reduced legal fees, reduced time to resolution, and less emotional toll on parties are just a few of the many advantages of this strategy. People with private legal issues and small and medium-sized businesses (SMEs) resolving business conflicts are among our project's intended users.

Keywords: Online Dispute Resolution (ODR), Artificial Intelligence, Justice-Assist, Legal Advice System, Cost Effective Legal Solutions, Small and Medium Enterprises, Remote Legal Assistance

Real-Time Gender Classification Using MiniXception and Hand Gesture Detection Using MediaPipe Framework

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Abstract— In human-computer interaction, gender classification and hand gesture recognition are essential technologies. This paper presents a real-time system that integrates gender prediction and face and hand gesture detection, utilising the Mini Xception model and MediaPipe framework. We address the requirements for efficient realtime operation by utilizing frame-skipping mechanisms in our work. The system comprises video capture with OpenCV, model integration using TensorFlow, and efficient data handling with NumPy. Extensive testing has proven its generalization to diverse settings and excellent performance, with 84% accuracy for both tasks, capable of real-time processing.
Keywords:Gender Detection, Mini Xception, Hand Gesture Detection, MediaPipe Library

Comprehensive Web Analysis of Automobile Websites: Performance, SEO, and Accessibility Insights

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Abstract— The current research work proposes a difficulty-driven comparison of three most visited automobile websites namely the Automobile Site1, Automobile Site2, Automobile Site3 on parameters including performance, Search engine optimization (SEO), accessibility and traffic. The research involves tools such as Yellow Labs, Google Page Speed Insight and Semrush with regard to the website's weight, loading time, user's interactions and search engine optimization. The findings reveal distinct strengths across the sites: From the three, Automobile Site1 is the most optimized and accessibly friendly site, the factors of search engine friendliness are as follows. Looking at the traffic and users of Automobile Site2, it comfortably outclasses the other sites in terms of page views as well as audience loyalty. At the same time, Automobile Site3 has relatively low first load time, which indicates fast website browsing while it is still relatively weak in terms of its SEO, and the usability of the site has to be improved in terms of theoretical potential. In conclusion, the realized comparison exposes the strengths and weaknesses of each site and is informative to future developments of the sites with an aim at better user interaction levels and competitive advantage.
Keywords: Website Performance, SEO, Accessibility, Automotive Websites, User Engagement

Design and Implementation of a Low-Cost IoT-Based Smart Agricultural System Using ESP32 andLoRa Technology

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Abstract—This paper presents the design and implementation of a low-cost IoT-based smart agricultural system utilizing the ESP32 microcontroller and LoRa technology. The system integrates multiple sensors, including those for soil moisture, temperature, and humidity, to monitor essential environmental parameters. It also supports real-time image capture for crop assessment using the ESP32-CAM module. Data collected by the sensors is processed by the ESP32 and transmitted wirelessly via LoRa to a central gateway, which connects to the cloud for storage and analysis. This architecture provides flexibility and long-range communication, making it suitable for large agricultural fields. An intuitive dashboard enables farmers to visualize real-time data and control actuators remotely, facilitating automated irrigation and other field operations. The proposed system emphasizes affordability, scalability, and ease of replication, offering a practical solution for enhancing productivity and sustainability in agriculture.

Keywords: IoT, Cloud, ESP32, ESP32-CAM, LoRa, DHT11

IoT Based Smart and Precise Autonomous Irrigation Management System

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Abstract—Traditional irrigation methods are highly inefficient, labor intensive, and results in water wastage. Additionally unpredicted weather, unanticipated rainfalls could compromise the crop health. Addressing all the challenges the proposed IoT system automates the irrigation by using real-time data such as rainfall, soil-moisture, humidity, temperature and crop area and sends to a python-based engine, which calculates water requirement, controls the water pumps in the fields through microcontroller NodeMCU, provides the required water to the crop. By doing so, the system not only conserves the water but also reduces the labor costs, prevents under- or over-irrigation, increases the crop productivity, promotes the sustainable farming practices. The updates regarding the irrigation can be viewed by the web application controlled by the python-engine. The system is versatile, suitable for open fields, aeroponic towers, gardens, small farms and research purposes. The desired objective is to reduce the water consumption by 40% and labor cost by 90%, make the irrigation efficient and reduce cost.

Keywords:IoT (Internet of Things), Smart Irrigation, Weather monitoring, Python-based engine, Moisture sensor, NodeMCU.

InceptionV3-Driven Multi classifier Voting System for Watermark Classification

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Abstract—Watermark text detection and classification are fundamental tasks in computer vision. This study addresses the challenge of classifying watermarked versus non-watermarked text in natural scene images by utilizing the InceptionV3 model for feature extraction. We evaluate the performance of three classifiers— k-Nearest Neighbors (k-NN), Support Vector Machine (SVM), and Random Forest (RF)—in distinguishing between these text types across two distinct datasets. By applying our method to these datasets, we ensure a comprehensive evaluation and assess the robustness of our approach. The results underscore the effectiveness of the InceptionV3 model in capturing relevant features, followed by a comparative analysis of the classifiers based on accuracy, precision, and recall. To further enhance classification performance, a weight devoting decision mechanism is employed, leveraging the strengths of each classifier. The weighted voting accuracy for Dataset1 and Dataset2 are 95.02% and 92.72%, respectively. The weighted voting approach combines individual classifier predictions based on their performance metrics, resulting in improved accuracy and more balanced classification results.
Keywords:InceptionV3, Voting System, Digital Water- marking, Natural Scene Images, Deep Learning, Watermark Text Classification.

Design and Evaluation of IoT Prototypes: Leveraging Test-Beds for Performance Assessment and Innovation

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Abstract—When discussing the Internet of Things (IoT), connected devices and systems can be seamlessly integrated. While creating and prototyping IoT systems is often necessary, designing, testing, and evaluating IoT prototypes require robust frameworks and methodologies to ensure reliable performance and foster innovation. This paper examines test beds as controlled environments for performance assessment of IoT prototypes, focusing on their design and evaluation. Test beds are crucial as they simulate real-world conditions, enabling iterative improvements and driving innovation in IoT solutions. The paper outlines key methodologies for developing IoT prototypes, highlights the role of test beds in the validation process, and evaluates case studies that demonstrate their impact in addressing inefficiency, unreliability, and non-scalability. By combining cutting-edge technologies with data-driven decision-making, the paper provides actionable insights on leveraging test beds to accelerate IoT innovation while addressing critical challenges such as interoperability, security, and scalability.
Keywords:Internet of Things (IoT), Test-Beds, Performance Assessment, IoT Prototypes, Innovation Frameworks, Scalability and Reliability.

A Multi-Algorithm Stacking Approach to Lung Cancer Detection with SVM, GBM, Naive Bayes, Decision Tree, and Random Forest Models

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Abstract—Lung health is one of the most minor medical issues globally because of its low mortality rate and high chance of early detection. The model presented here is a multi-model design that uses vector machines, gradient boosting machines, random forests, decision trees, and naive non-Bayesian machine learning techniques to worsen lung cancer diagnosis. This method is avoided for the lung cancer dataset from Kaggle, and a fragmented model is used to undermine the model's performance. It is seen that among the combinations, the stacked model and SVM have the highest accuracy of 0.95, followed by GBM with 0.944, random forest with 0.944, decision tree with 0.93, and naive Bayes with 0.87. The assembly model combines the outputs of various distributions to make the hull robust and accurate. This study emphasizes the potential of using machine learning to enhance self-treatment outcomes for cancer patients and, therefore, calls for early diagnosis to reduce mortality rates.
Keywords:Lung Cancer Detection, Machine Learning, SVM-Support Vector Machine, Gradient Boosting Machine- GBM, Random Forest, Naive Bayes, Decision Tree, Stacking Algorithms.

A Hybrid CNN-LSTM Model for Enhanced Intrusion Detection in Internet of Things Environments

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Abstract—The rapid expansion of IoT networks has introduced significant security challenges, with various sophisticated cyber-attacks targeting these systems. Traditional Intrusion Detection Systems (IDS) often strain to effectively classify complex, high-dimensional IoT traffic, especially when faced with multi-class attack scenarios. We propose a hybrid deep learning approach that integrates Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM) networks to address this challenge. The model is specifically designed to harness the strengths of both architectures: CNN for capturing spatial patterns in the data and LSTM for learning temporal sequences. By combining these capabilities, the CNN-LSTM model aims to achieve accurate classification of network traffic. Using the NF-BoT-IoT dataset, our model effectively distinguishes between benign and malicious traffic in both binary and multi-class contexts. In binary classification, it attained an average accuracy of 99.52% and an F1-score of 0.9923, while in multi-class classification, it maintained a high accuracy of 98.89%, demonstrating robust performance across diverse attack categories. These results suggest that our hybrid CNN-LSTM model is a highly efficient solution for real-time intrusion detection in IoT networks, with strong potential for practical deployment across distinct network environments.
Keywords: Internet of Things, Intrusion Detection Systems, Cyber-Attacks, Security, Deep Learning.

Pathology Image Classification for Colorectal Cancer Prediction Using Experience Replay

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Abstract—Pathology image classification helps diagnosis and monitoring as well as treatment of a disease. Thus, it can help the decision-making of a health worker. Still, conventional machine learning models struggle with medical data that often changes, as the typically need are training on the full dataset to learn new information on a frequent basis. This retraining requires a lot of computations and sometimes loses what it "knew" previously. This is called catastrophic forgetting. To solve this problem, we propose a continual learning framework, using Experience Replay to gradually add new pathology image data, while retaining knowledge of older tasks. Using Experience Replay, the model replays a sample of past data while training so that it does not forget any new information. The proposed framework is validated on the Path MNIST dataset, where it shows better classification accuracy and robustness than the classical re training. This indicates that continual learning as the potential to be used for pathology image classification, and as a result, it can be scalable and adaptive to the needs of large-scale medical data. Through such advancements diagnostic accuracy will increase, resource use will become more efficient, and patient outcomes will improve in medicine.
Keywords:Catastrophic forgetting, Colorectal Cancer, Continual Learning, Experience Replay, Medical imaging, Pathological diseases, Pathology image classification.

Federated Learning in Healthcare: A Privacy-Preserving Approach to Predictive Analytics

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Abstract— Technology such as machine learning in healthcare has pushed privacy concerns to the point that the handling of sensitive patient data has become paramount. In the context of FL, predictive analytics without data sharing between institutions can be performed through the process. Next, we explore the application of FL in healthcare in order to maintain data privacy while obtaining robust predictive models. FL utilizes aggregated decentralized data from multiple healthcare providers to reduce the chance of data breaches and continue to be compliant with rigorous regulatory frameworks, like HIPAA and GDPR, while doing so. In this work, we evaluate the model performance of FL models in predicting different types of health outcomes in comparison with traditional centralized models. We show that FL can achieve similar predictive accuracy while maintaining data privacy, which makes the choice of FL as a viable alternative to privacy sensitive healthcare environments. Second, applying FL is very challenging: there are communication overhead, data heterogeneity, and security risks. This study also considers ways to minimize these challenges. The results demonstrate the promise of Federated Learning as an innovative paradigm for applying predictive analytics in healthcare, indicative of a robust shift toward more secure, efficient and privacy preserving healthcare systems.
Keywords: Federated Learning, Healthcare, Privacy-Preserving, Predictive Analytics, Decentralized Data

Real-time Data Management in Embedded Systems Using a Circular Queue for Efficient Memory Utilization

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Abstract— A very crucial factor for reliable performance in embedded systems with limited memory is the efficient management of real-time data. They usually incorporate a linear buffer as a traditional approach which is ineffective as it can create issues such as buffer redundancy, data loss or slow computer processing speeds. Thus, the proposed research employs a con- trolled overwriting circular queue which not only utilizes compact memory, but also securely contains equal amounts of data. This systemic approach safeguards against buffer overuse and promotes effective use of memory. In order to make use of UART communications effectively, the use of ring buffers together with error-checking enables accuracy of data and minimization of delays which in turn enhances the responsiveness of the system. Test results confirm the efficiency of such an approach, where the efficiency of data transferring is increased significantly together with the reliability aspect of data insertion speed which is 26.54 percent faster and the time requirement for the retrieval of such data of about 15.4 percent therefore making optical sensors fit well and hassle free within dynamic changing circumstances
Keywords:memory, queue, embedded, data structures, efficient

AI-Driven Clinical Decision Support Systems: Revolutionizing Healthcare with Predictive Models

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Abstract—The integration of artificial intelligence (AI) into Clinical Decision Support Systems (CDSS) is changing the face of healthcare by allowing AI powered predictive, data driven insights, enabling medical practitioners to prolong their diagnosis and treatment planning. To make better and faster clinical judgements, CDSS based on AI using machine learning techniques such as ensemble methods and deep learning is discussed in this paper. He said most of the focus is on models that can predict future events, diagnose plagues and deliver tailored treatment programs sifting through mountains of health care data, such as genetics, medical imaging and EHRs. Some of the main problems we work with as we implement AI driven CDSS is its data privacy, model interpretability and integration to current healthcare processes. In addition this study summarizes recent advances in artificial intelligence (AI), enabling real time analysis and making real time decisions to improve patient outcomes and reduce workloads of healthcare personnel. Case examples that employ AI-CDSS to identify diseases, optimize treatments and predict risk are provided to show how they can change the face of clinical practice. Finally, we explore where AI healthcare may be going from here with a focus on the importance of deploying these systems with patient well being in mind and with full compliance to the relevant regulations.
Keywords: AI-driven CDSS, predictive models, healthcare, clinical decision support, machine learning.

Smart garden watering and lighting system integrated with machine learning model to maintain urban gardens

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Abstract—Garden maintenance may be a difficult task, particularly in urban settings. Many people are not skilled enough to determine their plants' precise requirements for lighting and watering. Conventional gardening techniques frequently result in under watering or over watering, wasting resources, and producing unhealthy plants. Our completely automated smart garden watering and lighting system offers a fully automated solution to these problems. With its sophisticated sensors, this system keeps an eye on the quantity of moisture in the soil and the amount of sunshine it receives, making sure plants get the correct amount of both for healthy growth. Traditional gardening involves guess work and physical effort, which our solution avoids by automating the irrigation and lighting operations. You may have the advantages of a flourishing garden without the trouble of ongoing upkeep with our intelligent gardening system. Our method offers a dependable and effective solution to care for your plants and improve your urban green space, regardless of experience level.

Keywords:Garden Maintenance, Internet of Things, Ma- chine Learning, Real time system, Support Vector Machine,

The Analysis of Anomaly Detection in Patterns from Remotely Sensed Image

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Abstract—Anomaly detection in remotely sensed imagery constitutes a pivotal endeavor with a multitude of applications, encompassing areas such as environmental surveillance and precision agriculture. A variety of methodologies have been formulated to augment the identification of anomalies, defined as deviations from anticipated patterns within image datasets. These approaches capitalize on sophisticated computational strategies and advanced machine learning algorithms to enhance both accuracy and operational efficiency. Anomaly detection in remotely sensed imagery can be implemented through an array of techniques, including heterogeneous and edge computing, convolutional neural networks, multi-dimensional feature spaces, unified anomaly detection frameworks, and unsupervised learning for the identification of burnt areas, among others. This manuscript elucidates various methodologies and state-of-the-art technologies pertinent to anomaly detection. While all these approaches demonstrate considerable progress, challenges and limitations persist regarding computational resource demands and the necessity for real-time processing capabilities. Future investigations may emphasize the optimization of these models to facilitate broader applications and to enhance their adaptability to novel data sources.

Keywords: hyperspectral images, remotely sensed images, anomaly detection, auto-encoder, convolutional neural network

A Comprehensive Analysis on Severity Estimationof Plant Diseases by Deep Learning Models

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Abstract—The rapid spread of diseases and pest infestations has a detrimental effect on plant health. Methods for disease classification and detection have gained new insights from the developments in computer vision and deep learning approaches. However, there has been relatively limited work in the area of severity estimation and disease progression rate since it requires more detailed information such as the percentage of affected leaf area, symptoms intensity, and environmental factors that lead to the disease progression over time. Thus the modern agricultural sector faces a significant difficulty in the assessment of plant disease severity and tracking of disease development. The purpose of this study is to perform a thorough review of various deep learning methods for plant disease severity assessment, taking into account factors like accuracy, severity level measurement, and dataset employed. The article also suggests ways to address the short comings of the current approach.
Keywords: Plant Diseases, Severity Estimation, Machine Learning, Deep Learning, Convolutional Neural Network (CNN).

Smart Ai-Based Delivery Robot

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Abstract— Humans are responsible for the majority of delivering the packets over the area of a network. When compared to classic delivery system the Autonomous Delivery Robot(ADR's) is meant to deliver the goods instead of a human involvement. The delivery robots are a contact-less and alternative to human interaction. At their core, we design a budget-friendly prototype for an Autonomous Delivery Robot (ADR) that can deliver packages to their destinations safely. This robot uses a GPS (like a car's navigation system) to find its way around. We use a special kind of computer brain called Artificial Intelligence to understand the best way to go. Once delivery robot know the right path, it follows until it reaches to the final stop. The robot keeps packets secure by putting them in a special container that needs a secret code to open. The secret code to open the container can be sent to the customer mobile when they order something. Once the robot delivers your package, it can find its own way back to where it started.
Keywords:Artificial Intelligence, Automation, Real-time Monitoring, security

Deep Learning-Based Approaches for Brain Stroke Detection: A Review

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Abstract— Stroke is one of the leading causes of death in adults around the world and demands prompt and accurate diagnosis to start treatment in time. In these directions, there are recent progress in deep learning such as CNNs, transfer learning methods, and a variety of hybrid models, which are quite promising to be highly relevant for the detection and, even, prediction of brain stroke. Two broad areas form this framework: analysis of medical images (CT, MRI) and real-time bio-signal processing (EEG). Despite all this, there is still room for improvement—for example, requiring large diverse datasets, providing an outcome to address class imbalances, and ensuring models generalize well. Deep learning in conjunction with clinical expertise can greatly help improve the detection and prediction of stroke, thus shortening treatment times and allowing more favorable patient outcomes. Further research is necessary to bypass these limitations and eventually realize its full potential.

Keywords:BrainStroke,CTImages,TransferLearning,Hybrid Models, CNN, Hybrid CNN, OzNet, Early Prediction, Decision Tree, Alex-net, VGG-16, K-Nearest Neighbor(KNN).

Cyber security with Machine Learning:Implementing AI Algorithms for IntrusionPrevention, Advanced Data Protection, and Real-Time Threat Analysis

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Abstract— In an era where cyber attacks are getting increasingly complex, the incorporation of machine learning (ML) algorithms into cyber security processes has emerged as a crucial technique for boosting protection against potential intrusions and data breaches. For the purpose of preventing intrusions, providing superior data protection, and conducting real-time threat analysis, this research investigates the application of machine learning approaches that are driven by artificial intelligence. Organizations are able to increase their preventative defenses against cyber attacks by utilizing algorithms that are capable of analyzing massive volumes of data and identifying patterns that are indicative of harmful behavior. Several machine learning (ML) approaches, including supervised and unsupervised learning, anomaly detection, and neural networks, are investigated in this study. The purpose of the study is to demonstrate the usefulness of these approaches in identifying and responding to a wide range of security concerns. In addition to this, the research investigates the significance of continual learning and adaptation in machine learning models, which enables these models to develop alongside developments in new threats. The findings highlight the potential for machine learning to change cyber security frameworks by delivering speedy and automatic reactions to incidents. This would lead to the protection of sensitive information and an overall improvement in the system's resilience. In the end, this research highlights the importance of implementing tactics that are based on artificial intelligence in order to meet the intricacies of modern cyber threats and maintain robust security in a world that is becoming increasingly digital.

Keywords: Intrusion prevention, Data protection, Threat analysis, Anomaly detection, AI algorithms, Cyber threat intelligence, Supervised learning, Unsupervised learning, Neural networks.

A Survey on Hand Gesture Sign Language Recognition With Arduino Leonardo

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Abstract— This study examined the research on the project investigates the integration of sign language into a hand gesture recognition system that relies on vision. the review's findings indicate that the field of The study of hand gesture recognition using eyesight is dynamic, with several investigations carried out and dozens of articles published yearly in journals and conference proceedings. Three crucial elements of the vision based hand gesture recognition system, notably hand gesture representation, were the focus of the majority of these studies. deep learning methods with an Arduino Leonardo for hand gesture recognition. An accelerometer sensor on the Arduino Leonardo records dynamic hand movement data. After being sent to a computer, this sensor data is processed by a deep learning model that has been trained to identify particular motions. I practice word-by-word modeling rather than two word, two-line training.

Keywords:Arduinolenardo, ASL,ISL, SSL using, DL ,CNN, KNN,GCN

Brain tumor Identification and Diagnosis using YOLOv10

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Abstract— The field of medical imaging has been greatly impacted in recent years by developments in deep learning and artificial intelligence, especially in the detection and diagnosis of brain tumors. In order to improve the accuracy and efficiency of brain tumor diagnosis on MRI scans, this research explores the possibilities of YOLOv10 (You Only Look Once), an inventive object detection algorithm. YOLOv10 differs from conventional segmentation techniques in that it incorporates state-of-the-art neural network architectures to offer real-time cancer region detection and classification. We investigate how well the model performs in relation to the most advanced methods currently in use across a range of parameters, including false positive/negative rates, processing speed, and detection accuracy. Our results show that YOLOv10 performs better in localizing tumor boundaries while undergoing rigorous testing on a sizable dataset of annotated MRI images. Brain tumors present a major challenge to patients and the medical community, requiring novel strategies for accurate diagnosis and early identification. This journal article examines the state-of-the-art discoveries at the nexus of neuroscience and medicine that have transformed the area of diagnosing and detecting brain tumors.

Keywords: ArtificialIntelligence, YOLOv10, Convolutional Neural Networks, Deep Learning, Machine Learning, Brain Tumor.

An Approach of ML & DL to Analyze Brain Tumor Prediction

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Abstract-Accurate brain tumor prediction in MRI images is a critical aspect of modern neuro-oncology, significantly impacting patient outcomes through early diagnosis and targeted treatment. Our proposed paper explores applying traditional Machine Learning (ML) and Deep Learning (DL) techniques like Convolutional Neural Networks (CNN) to enhance detection and classification. Integrating data augmentation, transfer learning, and advanced image pre-processing techniques has further refined model performance, enabling the practical analysis of low-quality MRI scans. However, challenges remain in ensuring model interpretability and addressing class imbalance in training datasets.This study highlights the current landscape of brain tumor detection methodologies using ML and DL, emphasizing the need for robust models that provide high accuracy and offer transparent decision-making processes. By synthesizing findings from various research efforts, this paper aims to contribute to the ongoing development of reliable AI-driven diagnostic tools that can assist medical professionals in the challenging task of brain tumor identification.
Keywords: ML, CNN, DL, Hybrid Models.

Enhancing NLP for Indic Languages with Limited Resources: A Study of Transformer Models for Translation and Summarization

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Abstract—Significant advancements have been made in natural language processing (NLP), especially in numerous languages. The vast linguistic diversity of India presents unique challenges for automated language processing tasks as Indian languages other than Hindi are marginalized in both cases; datasets which incur a vast toll on summarization models that require huge datasets to be trained on. This paper presents a comparative and comprehensive analysis of multiple transformer-based models which have been trained and/or fine-tuned for lesser-used Indic languages. Purely focusing on Natural Language Translation (NLT) and evaluating its efficiency in generating contextually accurate summaries for languages such as Bengali and Marathi. Models such as mT5, IndicBART, mBART and other multilingual NLP models will be benchmarked and assessed using the ROUGE score. This study highlights the model's strengths and weaknesses in handling the limitations summarization of low-resource Indic languages. The findings will contribute heavily to the development of NLP tools aimed at improving summarization inclusivity across India's diverse languages.
Keywords:Indian language summarization, Sequence-to-Sequence models, mBART, mT5, IndicBART, ROUGE

Building Resilient CICD Pipelines: A DevOps Security-First Framework

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Abstract—Continuous Integration and Continuous Deployment are now integrated in automated systems that enhance code stability, and accelerate the deployment process as well as improving monitoring of the whole system in the software development field. This document deals with setting up of a strong CI/CD process involving AWS cloud services and DevOps. The infrastructure is built with the help of Terraform which ensures the scalability and repeatability applying the Infrastructure as Code (IaC) approach. A safe Virtual Private Cloud (VPC) is designed consisting of public and private subnets, load balancing for traffic distribution, and CloudFront CDN to improve geographical distribution. Jenkins is used in CI process to perform disk analysis, OWASP and Trivy vulnerability scanning, and making Docker images. The CD phase useArgoCD for updates on Kubernetes and integrates Monitoring and observability using Prometheus and Grafana. Notifications are produced to JIRA and email communication for improvement. With the help of the offered cloud services and DevOps tool it is possible to consolidate the SDLC and bring effects in code safety, testing and utilization. This document also provides an overview of methods, instruments, and outcomes, demonstrating how the CI/CD automation influences the development and operation positively.

Keywords: Continuous Integration/Continuous Delivery (CI/CD), DevOps workflow, Infrastructure as Code (IaC), Amazon Web Services (AWS) Cloud Solutions, Terraform, Kubernetes, Docker, Jenkins, ArgoCD, SonarQube, OWASP Dependency Checker, Trivy, Prometheus, Grafana, Version control systems, Cloud system architecture, Containerization technology, Scalability solutions, Observability tools, Automated testing processes, Continuous deployment, Build automation techniques, Email/JIRA integration.

Black hole attack detection using dynamic threshold values and residual energy in VANETs

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Abstract—In black hole attack, a hostile vehicle or node within the VANET pretends to have the optimal route to the destination, convincing other nodes to route their data packets through it as they head towards the destination, trailing behind the malicious node, receives the data, it either discards the packets completely or forwards them selectively, causing disruptions in communication. To overcome this dilemma the research discusses a novel approach for categorizing nodes in AODV (Adhoc On demand vector Routing Protocol) networks according to their residual energy (RE) and forward rate (FR). With the goal to identify nodes that are considered energy-constrained, the proposed approach defines a residual energy threshold (RET) and includes dynamic threshold values (MinDTV and MaxDTV) for the forward rate. Three categories are applied to nodes: 1. (Trusted), 2. (Intermediate), and 3. (Untrusted or Energy-Constrained). This methodology results in a more trustworthy and energy-efficient network by dynamically updating node selection based on present forwarding behavior and levels of energy. The proposed approach boosts the overall strength, longevity as well, and integrity of RPL networks through the elimination of energy-depleted and unstable nodes; hence, it is especially suitable for applications in scenarios with scarce resources and malicious activity.

Keywords:black hole attacks, threshold values, residual energy.

A Comprehensive Comparison of Machine Learning Classification Techniques for Early Detection of Alzheimer's Disorder

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Abstract—Alzheimer's disorder (AlzD) is a chronic condition in which brain cells degenerate and eventually die. People over the age of 65 are most likely to get this condition. There is no cure for this, but nowadays proper medications and treatments are available to slow down the disease progression temporarily. Detection of AlzDin its early stage may help doctors and physicians provide proper medicines as early as possible to slow its development. Artificial intelligence is a blooming field in every sector nowadays that can help in AlzD detection to save us from time-consuming and expensive conventional methods. Various machine learning algorithms are researched to prevent AlzD. This paper uses different linear, distance, and tree-based supervised classifier algorithms. The used dataset contains different psychological parameters like a person's age, number of visits, Mini-Mental State Examination (MMSE), and years of education, on which machines can be trained to predict whether the person is demented or non-demented. The main goal of this research paper is to compare these classification algorithms which give the best result in the early detection of AlzD.RFC, KNN, and MLP algorithms outperform all other algorithms with an accuracy of 96.77%, followed by NB and LR algorithms with 95.70%.

Keywords:Alzheimer's disorder (AlzD), Machine Learning (ML), Random Forest classifier, Decision Tree, Multilayer Perceptron(MLP)

Development of Interactive Assistance for Academic Preparation Using Large Language Models

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Abstract—With the increase in capabilities and availability of large language models, it is inevitable that it finds its way into application in a variety of domains. Education domain has seen remarkable improvements in both efficiency and capabilities with the incorporation of innovative and latest technology to improve the experience for both teachers as well as students and when talking about latest technologies it is impossible to not talk about large language models. Their ability to contemplate huge volumes of data as well as generate human-like responses to queries related to data it possesses has made many industries rethink certain aspects of their workflow to integrate this powerful technology to improve the working efficiency. Education sector can benefit from this technology in various aspects. This project aims to integrate the usage of locally run large language models using Ollama and LangChain to build a conversational platform application for the usage by students for assisted learning. The model also utilizes Retrieval Augmented generation techniques for creating an updated and dynamic large language model. To promote transparency state-of-the-art open-source technologies are preferred rather than closed source technologies like OpenAI's ChatGPT

Keywords: RAG, LLM, NLP, LangChain, Ollama, vector embedding.

Move Match : Live Dance Motion Monitoring and Feedback System

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Abstract—Dance movement accuracy prediction is a critical component of modern dance training, yet traditional methods often lack objectivity due to the subjective nature of evaluations and the complexity of human movement. To address these challenges this paper introduces Move Match, which is a web-based platform built for real-time dance movement prediction. By leveraging deep learning techniques, the platform performs posture estimation in real-time and detects key points. The system compares the detected poses using Euclidean distance to calculate the alignment between corresponding keypoints which provides a quantitative measure of the user's accuracy. Based on this comparison, Move Match delivers real-time feedback, offering an accuracy score and personalized suggestions for improvement. This immediate feedback fosters a more efficient and engaging learning experience for dancers. Extensive testing of Move Match in various dance styles demonstrates its effectiveness in objectively assessing performance, enhancing both training quality and accessibility. The integration of pose estimation, deep learning and real-time comparison offers a novel, user-friendly solution for dancers seeking to improve their skills, transforming traditional dance education with AI-driven insights.

Keywords: DeepLearning,MoveNetModel,PoseEstimation, Euclidean Distance,Accuracy Prediction.

TurfIt: An Instant Turf Booking Application

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Abstract—As sports grow in popularity need for effective online turf booking applications has also increased. Although some existing applications are faced with numerous challenges such as; restrictions on access, ineffectiveness in scheduling, and over-bookings, leading to frustrations and operational problems. This paper focuses on those problems by the presentation of an online turf booking application to streamline the booking process. The solution offers real-time updates, automatic payment, and safe transactions based on QR code. The more user-friendly the application is, the more efficient it will be. Firebase would be used for real-time data synchronization and the responsiveness of React interface ensures the smooth and conflict-free bookings. This solution would lead to increasing customer satisfaction as well as increasing the booking rates and effective utilization of sports facilities.

Keywords:Turf Booking, Turf Application, QR Code Payment, Firebase Authentication, Dynamic scheduling, User friendly, Secure Payments.

AI-Based Web Application Firewall

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Abstract—Web applications face an increasing risk of web-based attacks such as SQL Injection (SQLi) and Cross-Site Scripting (XSS), making the need for securing them more important than ever. This project focuses on building an AI-powered Web Application Firewall (WAF) that can identify and block such attacks using machine learning in real-time. We used publicly available datasets from Kaggle and performed preprocessing steps such as text cleaning and count vectorization to make the data analysis-ready. The models used include Logistic Regression, Random Forest, and Support Vector Machine (SVM). For SQLi, Logistic Regression achieved 96.83% accuracy, while for XSS, Random Forest achieved 99.88%. These models were embedded in a web application that takes user input, and the backend evaluates it to determine if it is a safe or malicious query, providing quick feedback. These results demonstrate that AI-powered firewalls can effectively detect and block SQLi and XSS attacks in web applications, helping secure them against data loss. We approached the project of protecting web apps from vulnerabilities through machine learning to provide a scalable solution and explore ML within cyber security.

Keywords:Web Application Firewall(WAF), SQL Injection(SQLi), Cross-Site Scripting (XSS), Machine Learning, Logistic Regression, Random Forest, Support Vector Machine(SVM)

Comparative Analysis of Encoder-Based and Decoder-Based Architectures for Automatic Conspiracy Theory Identification

K. Gupta
Industry Professional

Abstract— This study evaluates the performance of encoder-based and decoder-based architectures for the Automatic Conspiracy Theory Identification (ACTI) task, focusing on Subtask A, which involves detecting conspiratorial content in Telegram posts.I compared RoBERTa-based encoder models and OpenAI GPT-2 decoder models, both fine-tuned with uniform hyper parameters. My encoder-only model achieved an F1-score of 0.8211, while the decoder-only model reached 0.7464, both significantly outperforming the Kaggle baseline (0.5107) but falling short of the EVALITA winners' score (0.8572).The encoder model showed stronger performance in identifying conspiratorial content with fewer false positives, whereas the decoder model struggled with an increased number of false negatives. The results underscore the encoder-based model's effectiveness in this context and contribute to understanding the strengths and limitations of these architectures for conspiracy theory detection.

Keywords: Encoder-based architectures, decoder-based architectures, Automatic Conspiracy Theory Identification.

LIBERTUS: A Pretrained Multilingual Model for Cross-Lingual NLP Tasks

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Industry Professional

Abstract—This paper presents Team Allen AI's system, LIBERTUS, a pretrained multilingual model fine-tuned for various downstream NLP tasks across multiple languages. The model demonstrates decent performance, achieving F1-scores of 70% or higher for most language-task pairs, highlighting its effectiveness in multilingual contexts. Despite this, the system struggles with sub tokens of multiword expressions due to its training paradigm. Notably, I explored the cross-lingual capabilities of LIBERTUS, particularly in lemmatization, showing that transfer learning is viable with limited corpora. The limitations of my approach include the size of the pretrained model, the lack of a balanced token distribution strategy during pretraining, and the treatment of label combinations as individual classes, which restricted the model's ability to predict unseen combinations. Future work includes addressing these limitations to enhance performance.

Keywords: Multilingual model, cross-lingual capabilities.

Robust Intrusion Detection System to Protect Cloud Services

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Abstract—Cloud data centers are normally designed to handle dynamic work load and any type of large scale operation. But some of the characteristics of the datacenters make them vulnerable to Distributed Denial of Service attacks. An attack which involves data centers as target not only affect that center but also all the services hosted within that data center. Service availability will be severely affected by this attack. For a robust network defense mechanism, it is critical to detect and classify these attacks. The era that exists today is of Generative Artificial Intelligence and other technologies, which is very helpful to complete various tasks. Which can also be used for the effective detection of Distributed Denial of Service attack? To detect these attacks this project, propose a novel approach using BERT model. Transformer based architectures like BERT can be used to analyze various attack scenarios and predict potential attacks even it can specify the type of the attack. BERT is fine-tuned using a dataset containing both normal and Denial of Service attack from that the model can learn the subtle patterns which is helpful in distinguishing the types of this attack. In this project we compared the results with traditional models and BERT. From that we can see how BERT performs very well in the detection. Real time detection will provide a solution to overcome these attacks and provide a more robust defense against Distributed Denial of Service attacks.

Keywords:Network Intrusion Detection System, Distributed Denial of Service, BERT, Generative AI.

Gesture Showdown: Rock Paper Scissors with AI Vision

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Abstract—This paper presents a gesture-based Rock-Paper-Scissors game that leverages computer vision and hand gesture recognition to enable intuitive human-computer interaction. Utilizing MediaPipe's pre-trained hand tracking module, the system detects and identifies 21 hand landmarks in real-time to classify gestures as rock, paper or scissors based on angular relationships between key points. OpenCV is used for webcam integration and video frame preprocessing, ensuring seamless interaction. The game compares the recognized gesture with a computer-generated move, dynamically displaying the results and resetting after each round for continuous play. The system identifies gestures through precise angle calculations, differentiating between closed fists, open palms and extended fingers. Sample outputs demonstrate real-time gameplay scenarios, highlighting gesture recognition accuracy and user engagement. Future enhancements include refining recognition accuracy, adding multiplayer functionality, introducing customizable gestures, and deploying the game on web and mobile platforms for broader accessibility. This project showcases the potential of integrating AI and computer vision in creating engaging and user-friendly applications.
Keywords:Computer Vision, Hand Gesture Recognition, MediaPipe, Real-time Interaction, Rock-Paper-Scissors Game

AI Based Targeting and Tracking System

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Abstract— This paper introduces an AI-driven tracking and targeting system poised to revolutionize precision across surveillance, defense, and tracking. Traditional systems often struggle with dynamic environments and accuracy optimization. Lever- aging AI, our system integrates advanced computer vision and deep neural networks for real-time object detection and tracking. Through machine learning, the system adapts to evolving scenarios, progressively enhancing tracking performance. Additionally, prevention of casualties with respect of loss of life, this model acts as a firewall from possible threats. This AI-based system signifies a significant advancement, promising heightened precision and efficiency across diverse applications. Its integration of cutting- edge technologies positions it at the forefront of tracking and targeting systems, marking a note worthy contribution to the field.
Keywords: AI Driven Tracking, Targeting System, Precision, Machine Learning, Real-Time Object Detection, Defense.

Lung and Colon Cancer Classification using Convolutional Neural Networks

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Abstract— Lung cancer is a dangerous illness affecting humans. The kind and location of the cancer will mostly determine the course of medical therapy. Detecting cancer cells at the earliest possible stage has the potential to save a great number of irreplaceable human lives. Developing an automated method is crucial for early cancer detection. Despite various methods offered by scholars, prediction accuracy has always been a difficulty. To address this challenge, Convolutional Neural Network (CNN) - based Lung and Colon Cancer classification is presented in this paper. The dataset was gathered from Kaggle to train and test the network. The data is pre-processed to be suitable for the CNN model. The performance of the customized CNN model is evaluated in terms of accuracy, precision, recall, and f1-score. The proposed model is suitable for assisting doctors in classifying Lung and Colon Cancer.
Keywords: Lungs, colon, Customized CNN, Deep Learning, Classification.

Effectiveness Assessment of Different Deep Learning Architectures for Sentiment Analysis on Twitter during COVID-19

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Abstract—People are sharing their opinions, feelings, and attitudes about many aspects of the COVID-19 pandemic on Twitter, where social media activity has surged. In order to find the optimum approach, this study compares different deep learning architectures for sentiment analysis of COVID-19-related tweets. This article makes use of a large dataset of tweets concerning the COVID-19 pandemic, encompassing a wide range of opinions, from neutral to unfavorable. Thorough pre-processing of the dataset is carried out, including tokenization, removal of stop words, and application of methods such as word embedding to store semantic information in compact vector representations of words. Examined in this comparative study were three deep learning architectures that saw extensive use: RNNs, CNNs, and transformer-based models. Accuracy, precision, recall, and F1 score are some of the appropriate performance metrics that are used to train and evaluate each architecture. When it comes to conducting sentiment analysis on tweets pertaining to COVID-19, our experimental results provide useful insights into the efficiency and effectiveness of different deep learning architectures. Although all deep learning architectures demonstrate sentiment analysis capability, the study found that some designs offered better accuracy and sentiment prediction capabilities than others. Transformer-based models, such as the famous BERT architecture, perform quite well, particularly when it comes to understanding the complex sentiment dynamics in tweets and absorbing contextual information.
Keywords:Sentiment analysis, COVID-19, Twitter dataset, RNN, CNN, BERT.

Coronary Heart Disease Prediction Using CNN, RNN, LSTM and Attention DNN Model

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Abstract—Coronary Heart Disease popularly referred to as CHD is among the leading causes of death and illness across the global population making it imperative for the identification of an effective approach to its predictive modeling for early detection. The purpose of this research includes studying a dataset containing a variety of clinical characteristics in order to forecast CHD using sophisticated deep learning structures. Specifically, we implemented and evaluated four distinct models: Convolutional Neural Networks, Recurrent Neural Networks, Long Short-Term Memory networks, and Attention Deep Neural Networks (DNN). All models were trained and evaluated on data set and multiple performance measures like accuracy, recall, precision, and F1-score were used for the purpose. The experimental outcome showed that the Attention-based DNN had the highest accuracy rate of 91 % followed by the RNN with accuracy rate of 89%. CNN and LSTM models gave moderate accuracy but they did not outperform the best models among options.
Keywords: Coronary Heart Disease, CNN, LSTM, RNN, Attention DNN Model, Deep Learning, Prediction, Cardiovascular Disease

AI-Enhanced Depression Detection System: Integrating Multimodal Analysis for Early Diagnosis

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Abstract– Depression is a prevalent mental health condition affecting millions globally, often going undiagnosed due to social stigma and limited accessibility to healthcare. This study presents an innovative AI-enhanced system for early depression detection, utilizing multimodal analysis integrating natural language processing (NLP) and patient health metrics. Two machine learning models form the system's core: a text classification model leveraging logistic regression to analyze user inputs and predict emotional tone and a health-data-based model that incorporates factors such as BMI, blood features, and comorbid conditions for comprehensive evaluation. The models were integrated into a web application offering a dual advantage of accurate screening and accessible mental health recommendations. Results demonstrated high efficacy with classification accuracy exceeding 91% across models, underscoring its potential to transform early-stage mental health interventions. Future enhancements include adopting advanced deep learning frameworks and expanding multilingual capabilities to broaden accessibility.
Keywords: Depression Detection, Machine Learning model, Natural Language Processing, Logistic Regression.

Image Tampering Detection

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Abstract— This paper proposes an image forgery detection technique combining the use of Convolutional Neural Networks (CNNs) with Error Level Analysis (ELA) for efficiently distinguishing tampered images from those that are original. ELA identifies potential regions of manipulation based on the discrepancy of the compression artifacts, whereas the VGG16-based CNN classifier distinguishes between original and tampered images. The proposed model was assessed using the CASIA2 dataset, thus illustrating its effectiveness in accurately classifying images. This research contributes to the field of digital forensics, providing an advanced method for ensuring the integrity and authenticity of digital content, which is crucial for security and verification in various applications.
Keywords:Image Tampering Detection, Convolutional Neural Networks, Error Level Analysis, DigitalImage Forensics, CASIA 2 Dataset, VGG16 Fine-Tuning, Tampered Image Classification.

Optimized Hybrid Deep Learning Approach for Detecting DoS Attacks Using Feature Selection in Wireless Sensor Networks

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Abstract—The rapid growth of smart cities, healthcare monitoring, and environmental sensing relies heavily on the real-time data processing capabilities of Wireless Sensor Networks (WSNs). However, these networks face significant security challenges, particularly from malicious activities like Denial of Service (DoS) attacks, which can disrupt critical operations. A hybrid intrusion detection model that combines Convolutional Neural Networks (CNN) and Deep Neural Networks (DNN) to improve the detection of such threats has been proposed. The preprocessing phase includes the Synthetic Minority Over-sampling Technique (SMOTE) which mitigates class imbalances ensuring robust performance across diverse attack scenarios. The model incorporates advanced feature selection techniques including SelectKBest and Grey Wolf Optimization (GWO) to identify the most critical features for enhanced detection accuracy. The CNN component effectively captures local traffic patterns, which are then refined by the DNN for accurate classification. This hybrid model's effectiveness in detecting diverse DoS attack scenarios is evaluated using WSN-DS dataset, ensuring robust security for WSNs. By achieving an impressive 98% detection accuracy, this hybrid model proves to be effective in intrusion detection. Its applications can significantly strengthen the security and reliability of WSNs, ensuring uninterrupted operations in key sectors such as smart cities, healthcare, and environmental monitoring.
Keywords:Wireless Sensor Network, IntrusionDetection, Deep Learning, Feature Selection.

Comparative Performance Analysis of Machine Learning Algorithms for Non-Performing Loan Prediction

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Abstract—This paper investigates the application of machine learning models for Non-Performing Loan (N. P. L) prediction in the banking sector. The study evaluates the accuracy of diverse models, including traditional algorithms and advanced Machine Learning approaches such as Random Forest, Gradient Boost, XGBoost, LSTM, Decision Tree, Gaussian Naive Bayes and Light GBM. Training of the models are done on the dataset 'Training Data,' available on Kaggle under the notebook named “Loan Prediction Based on Customer Behaviour”. Data processing and analysis of the given dataset was done on Kaggle's Jupyter Notebook cloud environment by using Python programming libraries. Through rigorous experimentation, it has been attested that Random Forest classifiers stands out to be best performing model when tested across all the performance benchmarks. This information thereby offers valuable guidance for institutions aiming to strengthen N.P.L prediction mechanisms and overall risk management strategies.

Keywords: N. P. L,Machine Learning, Random Forest, Gradient Boost, XGBoost, LSTM, DecisionTree, GaussianNaive Bayes, LightGBM, AdaBoost, Vector Machines, Logistic Regression,SMOTE.

Comparing Deep Learning (CNN) Features with Hybrid models (HOG_CNN, LBP_CNN) for Classification of Leafs

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Abstract— Ayurvedic physicians use various leaves and plants medicinally, leveraging their consistent availability throughout the year to treat conditions such as skin disorders, colds, and memory enhancement. Leaves play a crucial role in plant identification, especially as fruits, seeds, and flowers often vary with the seasons. Leaf detection also aids forest management, remote sensing, and ecological assessments, providing data for species monitoring, vegetation mapping, and climate modeling. This study evaluates three methods for leaf classification: CNN (Convolutional Neural Network), LBP_CNN (integrating Local Binary Pattern with CNN), and HOG_CNN (combining Histograms of Oriented Gradients with CNN). Results indicate that while CNN alone is time-consuming and less accurate, integrating it with traditional feature extraction methods (LBP and HOG) significantly improves performance. Among the models, HOG_CNN achieved the highest accuracy with reduced processing time compared to standalone CNN. The dominance of the proposed models can be ascertained by measuring accuracy with various image sizes in contrast to other cutting-edge techniques.

Keywords: LBP, HOG, CNN, LBP_CNN, HOG_CNN.

Comprehensive Data Access Protection Suite

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Abstract— This research introduces the Comprehensive Data Access Protection Suite (CDAPS), an innovative approach to mitigating SQL injection (SQLi) attacks in web applications. CDAPS integrates three key components: honey tokens for early threat detection, dynamic privilege management for adaptive access control, and real-time monitoring for swift anomaly identification. By combining these elements, our system provides a multi-layered defense against evolving SQLi threats. Extensive testing across various attack scenarios demonstrates CDAPS's superior effectiveness in detecting and neutralizing SQLi attempts compared to traditional prevention methods. The system's ability to adapt to emerging threats and provide comprehensive logging for forensic analysis represents a significant advancement in database security. Our findings contribute to the field of web application security by offering a robust, integrated solution that not only enhances immediate threat response but also strengthens the long-term security posture.

Keywords:SQL Injection, Cyber security, Database Protection, Honey Tokens, Dynamic Privilege Management, Real-Time Monitoring, Web Application Security

Improved fuzzified LA transformer integrated CNN for person reidentification

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Abstract — Person re-identification is one of the challenging tasks in computer vision where the aim is to identify individuals accurately across various camera views in complex environments. Here, an advanced framework combining LA Transformer models and Convolutional Neural Networks with robust feature extraction for CNN and LA Transformer models with part-based attention mechanisms which are meant to deal with occlusion and appearance variation and aimed at extracting local features. The features extracted by the approach above are fused and refined with a Fuzzy Neural Network to integrate using fuzzy logic better features and improve classification accuracy. The proposed approach is effective due to the experimental result, which even surpasses standard approaches in challenging instances with higher Rank-1 accuracy and Mean Average Precision (mAP) for person re-identification benchmark datasets.

Keywords:Person Re-identification, Fuzzified CNN, Local Attention Transformer, Fuzzy Neural Networks, Deep Learning.

Eye-Gaze Controlled Virtual Keyboard Using Blink Detection for Accessible Hands-Free Communication

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Abstract—The inability to interact with traditional input devices like keyboards poses significant challenges for individuals with motor impairments. Existing assistive technologies often rely on cumbersome and expensive hardware solutions, which are not accessible to everyone. This paper addresses the problem by presenting an affordable and accessible gaze-controlled virtual keyboard that uses only a standard webcam. The project utilizes computer vision algorithms, specifically dlib's face detection and shape prediction, to detect facial landmarks and calculate the Eye Aspect Ratio (EAR), which enables accurate eye-blink detection. The system is designed to dynamically highlight letter groups on a virtual keyboard, allowing users to select keys through a series of eye blinks. The keyboard switches between letter groups and individual letters, facilitating text entry without requiring physical input. The proposed solution demonstrates how computer vision techniques can be used to enhance accessibility and independence for users with severe motor disabilities by providing a practical and user-friendly interface.

Keywords:gaze-controlled keyboard, assistive technology, computer vision, Eye Aspect Ratio (EAR), dlib, eye-blink detection, accessibility, motor impairments

Multi Disease Prediction Related to Pulmonary Area by Leveraging Deep Learning

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Abstract—A large portion of the world's healthcare issues are related to conditions that impact the chest, heart, lungs, and respiratory system, which affect millions of people annually. To address this issue, we present the Deep learning-based model, which will detect multi diseases related to pulmonary condition. Multi pulmonary areas disease can be detected if the disease is present in the dataset of X- rays and CT Scans photos. This research shows the count of diseases out of the whole dataset taken. Its motive is to predict multi diseases related to the pulmonary area. This research will help the radiologists to make a quick diagnosis of pulmonary disease conditions. Ultimately, it will help the patients to have an earlier idea about disease to take treatment on time.

Keywords: Pulmonary, Dense Net, Deep Learning, Multi disease, prediction.

Detecting Cyber Threat Using Gen-AI

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Abstract—As we stand in the era of 6G, the ultra-fast and low-latency connectivity opens up numerous possibilities for innovation, across various sectors.These advancements bring more sophisticated cyber threats. The complexity and scale of 6G networks demand innovative approaches to cybersecurity, and this is where generative AI (GenAI) can play a transformative role. Traditional cybersecurity measures such as signature-based detection and heuristic analysis, have served us well in the past. The deep learning models like BERT have numerous in cyber threat detection, the need for efficient detection methods is critical because of more frequent and complex threats,With differential privacy with embedding perturbation technique(DPEP). The Bert model provides a cutting-edge architecture to detect threats with high precision. Through the experiments held on the Edge-IIoTset cybersecurity dataset, Bert has achieved 91.2% accuracy. Thus, Bert might be an optimal solution for real-time threat detection, especially for deploying resource-constrained IoT environments.
Keywords:BERT, Cyber Threat, DPEP,GenAI

Accessing Deep Learning Techniques for Commodity Price Prediction: A Comparative Assessment Across Energy, Precious Metal, and Agricultural Futures

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Abstract— This study performs an in-depth comparison of deep learning approaches - CNN, LSTM, GRU, and their bidirectional variants (BiLSTM and BiGRU) – to anticipate commodity futures prices, particularly in the crude oil, gold, and corn markets. The approach used in our study combines fundamental and technical factors with thorough variable selection to establish the most effective predictors. The Grid Search Cross-Validation approach is employed for optimizing the hyper parameters of deep learning architectures. The efficacy of applied models is evaluated using common evaluation indicators: Root Mean Square Error (RMSE), Mean Absolute Error (MAE), Coefficient of Determination (R2), and Adjusted R2. The results presented enhance the existing research on AI applications in financial markets, providing recommendations for the development of more precise forecasting techniques for researchers.
Keywords: Futures Price Prediction, Crude Oil, Gold, Corn, Deep learning, Grid Search, Feature Selection.

Summarization of Sanskrit Text: Approaches and Techniques

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Abstract—The authors present on-going work on Abstract Text Summarizing (ATS) for Sanskrit prose-it is the first ever attempt towards an ATS (SATS) for Sanskrit. It looks into the current approaches to the development of ATS and suggests appropriate approaches for Sanskrit considering its peculiar features. The purpose of SATS is to concise manuscripts, improve meaning processing, and improve information retrieval processes. Although extractive text summarization (ETS) is useful, it is often not consistent, making ATS preferable for high-quality summaries. The paper reviews ATS/ETS approaches for Sanskrit and other Indian languages and suggests that a translation-based approach may be the most effective due to Sanskrit's rich morphology. A graph-based approach and supervised learning are also proposed, with future work exploring the collection of languages.
Keywords: Abstractive Text Summarization (ATS), Sanskrit Text, Computational Linguistics

Generative Artificial Intelligence Based Biomedical Applications for Pharmaceutical Industry

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Abstract— The quick advancement in AI has led to the development of refined large language models (LLM). While LLM is a specific type of generative AI focused on generative text generative AI is a broader category encompassing various AI systems that can generate new content including texts, images, music, and more generation models. Generative AI is transforming various fields, like education, finance, marketing, fashion, gaming, medical area or healthcare. Generative AI finds its applications in improving drug discovery, biomedical instrument design, and healthcare delivery within the pharmaceutical industry. In this study, we aim to find generative artificial intelligence-based biomedical applications for the pharmaceutical industry.
Keywords:Generative Artificial Intelligence, Biomedical Applications, Pharmaceutical Industry.

Enhancing Security in Logic-Locked Systems Through UART-Based Key Authentication

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Abstract— The security of integrated circuits is crucial due to their wide range of applications in modern gadgets. An unauthorized access (i.e., third-party access) or a security breach in the logic-locked system can pose a great threat to user privacy, thus leading to data theft and misusing the user data. Several logic locking methods have been proposed, but with the advancements of technology, the latest attack techniques can easily crack those existing locking techniques. Thus, in this research paper we have proposed a sensor-based methodology to detect the unauthorized access with micro switch and UART. In a globalized world where the security of logic-locked systems is really important, this paper empathizes with UART-based mechanisms as a practical solution. By focusing on the existing logic locking methodologies, this paper contributes to the ongoing security efforts for a secured logic locked system.

Keywords: Logic locking, hardware security, UART, high-level synthesis (HLS), intellectual property (IP).

Deep Learning for Early Identification of Diseases in Tomato Leaf Crops

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Abstract— Early disease identification is essential for preventing crop loss in tomato leaf crops. Unfortunately, traditional manual methods are time-consuming and error-prone, making automated solutions necessary. This study aims to leverage deep learning, utilizing Convolutional Neural Networks (CNNs) for disease detection in tomato leaves. Experiments on image classification were conducted using three different models: ResNet50, VGG16, and an upgraded version of VGG19. The proposed VGG19 model demonstrated superior performance, achieving an accuracy of 99.5%, precision of 99.23%, recall of 99.47%, and an F1-score of 99.28%.In comparison, ResNet101 and ResNet50 also performed well but with slightly lower accuracy percentages, while VGG16 ranked last. The results indicate that the proposed VGG19 model is highly efficient for early disease detection in tomato crops and can serve as a powerful tool in precision agriculture.

Keywords:DeepLearning, CNN, Tomato Leaf Disease, Resnet, VGG19, Disease Detection

Harnessing the Power of AI with Deep Learning: Innovations and Implications

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Abstract — The rapid advancements in artificial intelligence (AI) and deep learning have revolutionized various sectors, enabling unprecedented levels of innovation and efficiency. This paper delves into the transformative impact of deep learning across multiple domains, highlighting key innovations and their broader implications. By examining cutting-edge applications in healthcare, finance, autonomous systems, and natural language processing, the study elucidates how deep learning models, such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs), are pushing the boundaries of what's possible. Moreover, the paper explores the integration of deep learning with emerging technologies such as the Internet of Things (IoT), edge computing, and quantum computing, underscoring the synergistic potential of these combinations. The role of deep learning in predictive analytics and personalized solutions is discussed, showcasing its ability to enhance decision-making processes and improve user experiences. Furthermore, the paper discusses the ethical considerations, challenges, and future prospects associated with the widespread adoption of deep learning technologies. The insights provided aim to foster a deeper understanding of how harnessing AI with deep learning can drive progress while addressing critical societal and technological issues.
Keywords: Artificial Intelligence (AI), Deep Learning, Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Healthcare

Modeling Recalls for Automobiles

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Abstract--Managing product recalls in the automotive industry is a critical and relevant challenge that directly impacts human lives and ensures the secure operation of automobiles. Product recalls involve withdrawing defective products from the marketplace, thereby reducing corporate liability for negligence. Current techniques and technologies for product recall management lack transparency, particularly in identifying recall data patterns and determining recall urgency based on potential risks. This study proposes a structured approach to uncover patterns in recall data and classify recalls according to their associated risks.The findings offer valuable insights for manufacturers and regulatory bodies, enhancing recall management processes. By addressing critical vehicle defects within appropriate timelines, this approach strengthens public safety and ensures more effective recall handling.
Keywords:Automobile, Recall management, LDA, Sentiment analysis, Text mining

Smart Agriculture: Increase the Crop Production, Water and Soil Fertility Using IOT Sensors

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Abstract—In recent years, advancements in Internet of Things (IoT) and sensor technologies have greatly influenced the agricultural sector. These innovations have introduced more efficient, automated systems that can monitor and manage farming processes with greater precision. Traditional farming methods, particularly in urban areas, often involve the heavy use of pesticides, which not only pose serious health risks to consumers but also degrade the quality of arable land. While organic farming offers a healthier alternative, it is not always a feasible option due to its high costs and resource-intensive nature. Hydroponics is a soil-less method of growing plants, using nutrient-rich water solutions to provide plants with essential minerals. Combined with our newly designed system, it offers an efficient and sustainable alternative to conventional farming methods. This research presents a smart hydroponic system powered by IoT technology, allowing for precise control of key environmental factors. The proposed system utilizes various sensors, including ultrasonic sensors for monitoring water levels and temperature sensors to regulate the environmental conditions. The system is designed to prioritize the maintenance of ideal temperature, water levels, and pH balance key factors that directly influence plant growth and health. By automating these processes, the system reduces the need for human intervention, offering a reliable and scalable solution for year-round crop production. This smart hydroponic system meets the growing global demand for sustainable agricultural practices, providing a viable alternative to both traditional and organic farming techniques, and ensuring consistent, efficient crop growth with minimal human input.
Keywords:Hydroponics, Arduino, pH Sensor, Electrical Conductivity, Automated Agriculture.

Synergy of AI and PMBLDC Motors: Enhancing Efficiency in Electric Vehicles

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Abstract -Electric vehicles (EVs) are showing a great deal of interest in Permanent Magnet Brushless Direct Current (PMBLDC) motors due to the growing need for environmentally friendly transportation options. The integration of Artificial Intelligence (AI) like Fuzzy Logic Controller (FLC) in the control and management of PMBLDC motors is revolutionizing the performance and efficiency of EVs. This paper explores the multifaceted applications of AI in optimizing PMBLDC motor operations, including advanced motor control techniques and adaptive performance tuning. AI enhances torque response, minimizes energy consumption, and extends motor lifespan. The synergy between AI and PMBLDC motors not only improves the driving experience but also contributes to the overall sustainability of electric transportation. This study highlights the transformative potential of AI in achieving higher efficiency and reliability in PMBLDC motor applications, paving the way for the future of electric mobility.
Keywords: EV, PMBLDC, AI, FLC, VSI.

AI-Driven Deep Learning for Automated Wheat Disease Detection

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Abstract — The title "AI-Driven Deep Learning for Automated Wheat Disease Detection" points to a major change in how we identify wheat diseases. Crop diseases are a major cause of reduced agricultural yields and contribute significantly to global economic losses in the farming sector. To mitigate these effects, it is essential to monitor and manage crop health effectively. Diagnosing wheat diseases involves figuring out what's affecting the plants, whether it's fungi, bacteria, or other harmful organisms. Accurate diagnosis is essential for safeguarding crops and helping farmers achieve a healthy and productive harvest. Here we use the advanced and powerful technologies like deep learning and Artificial Intelligence. For wheat farming, AI can swiftly and precisely identify diseases in plants. Deep Learning, a branch of AI, improves by analysing large amounts of data, like images of healthy and sick wheat. In earlier research, image classification for disease detection relied on manually designed features. However, recent advancements in Deep Learning have significantly enhanced the precision of object detection and classification. This research focuses on developing a deep learning model to identify wheat diseases from images captured directly in the field. Along with the detection of 15 various diseases of the wheat crop it also suggest the suitable pesticide. This research helps to build more accurate outputs than the earlier research by using advanced technologies.
Keywords: Deep learning, Wheat disease, Image Processing, Dataset, Classification, Segmentation.

Machine Learning Algorithm for Sensitive Data Classification on Cloud Environment

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Abstract—This electronic Digital information, computer systems, networks, and data are highly in need of protection from damage, unauthorized access, and internal and external threats. Cyber security involves the implementation of strong procedures to protect digital resources by ensuring confidentiality, integrity, and availability. In the dynamic landscape of cyberspace, Cyber security is the umbrella term for tactics, tools, and procedures used to fend off a wide variety of threats, such as ransomware, phishing, malware, and other unwanted activity. This field continually evolves to counter emerging risks and vulnerabilities, requiring a proactive approach to identify, assess, and moderate potential security breaches. Cyber security is fundamental in preserving trust and reliability in digital interactions, serving as a critical component in our interconnected and technology-driven world. Here we focused on the large amount of data set to identify the level of confidentiality required and categories them using machine learning approaches. The results will be carryied forward for the high computational encryption and decryption to provide high security and provide access as per the need of the users.
Keywords:Cloud Computing, Security, Machine Learning, Data Classification, Access Control.

Mathematical Capabilities of LLMs

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Abstract—Large language models (LLMs) have the potential to solve mathematical problems well, but little has been investigated. In this research, we evaluate five leading LLMs — (Gemini, Claude, Mistral, ChatGPT, and Llama — on a set of 50 mathematical problems that cover calculus, algebra, geometry, number theory, and probability. Finally, the study evaluates the accuracy of their solutions and gives the ability to assess their intermediate steps correctly. I created a primary dataset for comparison of the LLM performances and ranked the models according to how well they were able to solve those problems. It illustrates the shortcomings of present LLMs at reasoning and solving for mathematics and suggests what needs to be rectified in the LLMs. Future research will further refine this dataset and monitor the progression of LLM capabilities in solving more complex mathematical problems. (Abstract)

Keywords:LLM benchmarking, mathematical reasoning, dataset evaluation, model comparison, decision making, problem solving.

Loan Prediction Analysis Using Innumerable Machine Learning Algorithms

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Abstract—Internet loan fraud has emerged as a significant challenge in the financial industry, causing substantial economic losses and undermining trust in digital lending platforms. Applicants' information includes income, level of education, employment status, loan amount, and credit histories, among other relevant variable information. Data preparation should start with the essential data pre-processing tasks: imputation of missing values for variables, encoding categorical values, and normalizing of numerical features. The dataset is divided between training and testing subsets when evaluating the model. The XG-Boost classifier is utilized to predict loan approvals, with its performance gauged by metrics like accuracy, precision, recall, and F1 score. Hyper parameter tuning is used to improve model performance. Results suggest that the XG-Boost classifier provides high accuracy for loan approval predictions. Also, the feature importance analysis suggests key factors that have a strong influence on the model's decisions, showing the potential of the algorithm in helping financial institutions make better decisions. This study shows the scalability and effectiveness of XGBoost for practical credit risk prediction tasks.

Keywords: Loan prediction, XGBOOST, hyper parameter tuning.

Seasonal Analysis of Vegetation, Moisture, Urbanization, and Land Surface Temperature (LST) Using NDVI, NDMI, NDWI, and NDBI Indices: A Case Study of Sillod, Maharashtra

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Abstract— The study evaluates seasonal variations in land surface temperatures (LST) and their relationship with key remote sensing indices: the normalized difference built-up index (NDBI), vegetation index (NDVI), water index (NDWI), and moisture index (NDMI). These indices help analyse land use/land cover (LULC) impacts on LST using cloud-free Landsat 8 imagery from summer, winter, and rainy seasons of 2023. The focus is taluka Sillod, Dist. Chhatrapati Sambhajinagar, Maharashtra, India. LST and index values are influenced by cropping systems, vegetation cover, planting density, and growing season. NDVI is key for assessing vegetation health, NDMI monitors moisture, NDBI maps urban areas, and NDWI detects water bodies. Each index has strengths but faces challenges like atmospheric interference and mixed land cover classification. Recent advancements in high-resolution data and machine learning integration offer promising improvements for future applications in environmental monitoring.
Keywords: NDVI, NDMI, NDBI, NDWI, LST.

Efficient Load Balancing in Software Defined Networks using Unsupervised Meta-Reinforcement Learning

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Abstract—New technologies, such as cloud computing and big data, make traditional network management more difficult, while the network's user base continues to expand. Consequently, changes to the traditional network architecture are required. To address this issue and enhance network management compliance, a new idea called software-defined network (SDN) has been proposed. Due to limited network resources and to satisfy the criteria of quality of service, it is necessary to address numerous difficulties, one of which is load balancing (LB), which distributes data traffic among several resources to maximize their efficiency and reliability. The local information of a network is used to design LB in a typical network. Consequently, it is not very accurate. Still, software-defined network (SDN) controllers can see the network from anywhere in the world and make better LB. We provide a set of unsupervised meta-RL algorithms to build smart optimization architecture for SDN LB.
Keywords:Unsupervised meta-reinforcement learning, Optimization, Software-defined networking (SDN), load balancing.

Efficient Weather Forecasting using Machine Learning Models Using Data Balancing

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Abstract—precise weather prediction is a crucial study area for both disaster management and the tourism industry. The effectiveness of forecasting relies on various factors considered during the prediction process. This study concentrates on employing classification techniques to predict rainfall and associated categories. Due to the imbalanced nature of most raw data, many models struggle with prediction accuracy. To address this, the research proposes utilizing data preprocessing and the SMOTE oversampling method to balance the data and expand features. The study aims to evaluate the performance of several Machine Learning (ML) classifiers for weather forecasting. Five weather categories are used: rain, drizzle, snow, sun, and fog. The xGboost and Random Forest classifiers demonstrate the best results. The study also compares the performance of ANN, SVM, and decision tree-based classifiers. Accuracy, precision, recall, and F1 score serve as performance metrics. The proposed xGBoost approach achieves a maximum accuracy of 95%, while RF and ANN-based predictions show a 3-4% improvement.

Keywords:Weather Forecasting, ANN, SVM, Random Forrest, xGboost, Training, Testing

Plant Leaf disease classification and identification using Deep Convolution Neural Network

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Abstract—With the advancement of deep learning, and CNNs in particular, comes the ability to correctly classify plant diseases automatically with increased accuracy. This work provides a robust system by adopting CNN architectures and employing the application of transfer learning toward leaf disease classification in plants using diverse datasets, with proper preprocessing and augmentation. Deployed as a user-friendly application, the system demonstrates significant potential in enhancing crop productivity and minimizing losses through early disease detection.

Keywords:CNN, Dataset, Plant Village.

Design an Approach for Epileptic Seizure Detection Using EEG Patterns and Machine Learning Methods

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Abstract— Examining electroencephalogram (EEG) signals plays a crucial role in monitoring brain activity for diagnosing various conditions, with primary applications in detecting epileptic seizures and sleep disorders. Given the diverse range of EEG seizure patterns, there is a significant need to differentiate between normal and seizure data. This study proposes the extraction of time domain statistical and frequency features from EEG signals to enhance classification accuracy. A FIR filter is suggested as a preliminary step to remove artifacts from EEG signals. The research introduces a wavelet-based classifier for extracting EEG frequency features and contributes to the calculation of temporal statistical features using wavelet-based classifications. The study aims to categorize EEG signal patterns into Z, N, F, and S types. Power spectral density (PSD) and peak-to-peak difference (PPD) are utilized as specialized features for classification purposes. Additionally, temporal mean and entropy of EEG signals are employed as statistical features. This expanded feature set can be effectively used in machine learning (ML) based EEG pattern classification, achieving a maximum accuracy of 96.7%.

Keywords:EEG Classification, Epileptic Seizures, PSD, Wavelet Classifier, Machine Learning, FIR Filter, PPD

Cloud Computing: Innovations and Impacts on Global Data Infrastructure

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Abstract—Cloud computing has transformed global data infrastructure with unparalleled scale, flexibility, and accessibility. This study examines how cloud computing innovations have changed data storage, processing, and management worldwide. By examining the progression of cloud services from simple storage and computing to sophisticated platforms and SaaS, we examine how they have transformed corporate operations, economic growth, and societal development. Virtualization, containerization, serverless architectures, and edge computing are the main cloud computing advancements, which we investigate through a literature study and case studies. Data security, privacy, and regulatory frameworks are also considered while adopting the cloud. Cloud computing promotes digital transformation in banking, healthcare, education, and government, according to study. The industry's sustainability and green computing efforts and data centers' environmental impacts are also covered. We found that cloud computing continues to spur innovation by enabling new business models, global connectivity, and data-driven application growth. Cloud technologies' integration with AI, IoT, and 5G networks is likely to change the global data infrastructure, opening new research and development options. This report covers the cloud computing landscape, its advancements, and its potential to shape global data management and digital ecosystems.

Keywords: Data infrastructure, digital transformation, cloud services, societal development, digital ecosystems, artificial intelligence.

MEL Frequency Features Driven Deep Learning for Speech Emotion Detection: A Novel Model

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Abstract—Speech Emotion Recognition (SER) is a critical area of research in Human-Computer Interaction (HCI), aiming to develop systems capable of identifying and responding to human emotions conveyed through speech. This paper focuses on training a Deep Neural Network (DNN) model using Mel-Frequency Cepstral Coefficients (MFCCs) for feature extraction, a widely used and effective technique in this domain. To address the complexity of speech data, we utilized a deep learning algorithm, specifically employing the Long Short-Term Memory (LSTM) network, in conjunction with MFCC features.

Keywords:SER, MFCC, LSTM, Mel-Spectrogram, DNN

CNN-Based Machine Learning Model for Disease Prediction in Crops

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Abstract—Potato crops are vital to global food security, but they are susceptible to several diseases that hinder growth and yield. Traditional methods of detecting these diseases rely on labor-intensive lab tests and human observation. This research presents an enhanced machine learning model for detecting and categorizing potato leaf diseases, specifically early blight and late blight, using Convolutional Neural Networks (CNN). The model is trained on various datasets of potato leaf images, utilizing techniques such as hyper-parameter tuning, data augmentation, and transfer learning. The proposed model attains an accuracy of 96.11%, significantly improving upon existing methods. Image processing techniques, Segmentation is performed using K-means technique and feature extraction is done by utilizing gray-level co-occurrence matrix, along with multi-class support vector machines for classification, are employed. Additionally, the study shows that CNN performs better than Artificial Neural Networks (ANN) in image classification. The study demonstrates how AI and deep learning technology can be used in agriculture to improve crop management and enable early disease prediction. Experiments have been conducted using the real image dataset.

Keyword: CNN, Plant leaf Disease, SVM, Image Processing

Performance comparison of One-hot encoding vs Response coding in context of Social media text sentiment analysis

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Abstract—Most of the content on various social media platforms has enormous textual data. Before being used in machine learning models, this textual data must be transformed into numerical formats using feature extraction and feature engineering techniques to improve classification accuracy. Numerous methods, including Label Encoding, Response Coding, One-hot Encoding, and Binary Encoding, are available for converting textual input into numerical values, and these methods are effective in handling massive amounts of textual data. This study investigates how these methods can be applied to social media reviews and comments to establish the most effective encoding technique for classification machine learning models that recognize sentiment polarity. We selected a social media dataset with 44,955 tweets for our work and divided it into train, test, and cross-validation. Experimental results show that One-hot encoding performed the best with Logistic regression, whereas Response coding was less efficient.

Keywords: Sentiment analysis, social media data, Natural Language Processing (NLP), One-hot encoding, Response Coding, Logistic regression, Naive Bayes.

An Efficient HybridDeep Learning Model for Detecting Musculoskeletal Abnormalities

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Abstract—Deep Convolutional Neural Networks (DCNNs) have made tremendous advances in healthcare, but their limited perceptual capacities make it difficult to capture extensive structural details. To solve this restriction, this study presents a new technique which integrates the benefits of EfficientNet to perform local data extraction with DenseNet201 for processing global characteristics in pictures. The MURA dataset, which contains 40,005 radiographic pictures, is used in the project with the goal of enhancing radiographic image categorization, notably for identifying Musculoskeletal disorders. The goal of the project is to accomplish a more thorough analysis of radiological pictures by successfully collecting global as well as local information via the fusion of Efficient Net and DenseNet201. The proposed approach shows positive outcomes, with the combined approach obtaining an overall accuracy of 96.38% on the test dataset and a sensitivity of 0.90.

Keywords:DCNNs, MURA, Efficient Net, DenseNet201, Hybrid Model

Leveraging Artificial Neural Networks for Breast Cancer Detection and Prognosis

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Abstract—Breast cancer remains one of the leading causes of mortality among women worldwide, making early detection and accurate classification critical for improving patient out- comes. This study explores the application of Artificial Neural Networks (ANN) for breast cancer multi-class classification and prediction using the CBIS-DDSM: Breast Cancer Image Dataset. The model was trained to classify mammographic images into three categories: benign, malignant, and benign without callback, achieving an impressive accuracy of 99.6%. The choice of ANN was driven by its proven capability to model complex, non-linear relationships with in data, offering a significant improvement over traditional machine learning technique. Despite the challenges posed by the limited size and heterogeneity of the data set, the ANN demonstrated robust performance, highlighting its potential for clinical applications. The high accuracy of the model underscores its value as a reliable tool for aiding radiologists in the early detection and prognosis of breast cancer, which could lead to more effective treatment planning and better patient outcomes. This study lays the foundation for integrating advanced AI technologies into clinical settings, offering promise for more precise, timely breast cancer diagnoses.

Keywords:Breast Cancer Classification, Artificial Neural Networks (ANN), Medical Image Analysis

H-Shaped Multi-Analyte PCF-Integrated SPR Sensor For Multi-Industry Fluid Analysis

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Abstract—This research conducts a numerical investigation of a multi-analyte H-patterned photonic crystal fiber (PCF) sensor utilizing surface plasmon resonance (SPR) technology developed to recognize industrial fluids in various medical and chemical applications efficiently. The sensor incorporates two fluid channels, simultaneously detecting multiple analytes. It uses a gold-titanium dioxidecoated plasmonic layer, providing high sensitivity, improved electric field confinement, and chemical stability. The sensor is optimized for refractive index ranges of 1.34–1.38 in channel-I and 1.39–1.43 in channel-II, both with high accuracy. This study aims to develop a platform for real-time analyte monitoring. The Finite Element Method is applied for arithmetical assessment after refining the sensor's architectural parameters. The sensor demonstrates a peak wavelength sensitivity of 4,000 nm/RIU in channel-I and 28,000 nm/RIU in channel-II. Additionally, it achieves maximum amplitude sensitivities of 410.64 RIU^{-1} and 1561.55 RIU^{-1} in the respective channels. This corresponds to a resolution of 2.5×10^{-6} RIU for channel-I and 3.57×10^{-7} RIU for channel-II. This sensor is designed to detect unknown substances with RIs between 1.34 and 1.43, making it valuable for biological fluid diagnosis, food quality control, environmental monitoring, and chemical analysis.

Keywords:PCF based sensor, multi-analyte detection, SPR-based PCF, H-Patterned fiber, Chemical Industry, Clinical industry sensor

Classification of Millet Cultivars using Image Processing and Machine Learning Techniques

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Abstract—India is one of the leading producers of various millet cultivars. Indian millets are a class of highly nutritious, drought-resistant crops primarily cultivated in the country's semi-arid and drought-prone regions. The most popularly cultivated millet varieties in India are Sorghum (Jowar), Pearl millet (Bajra), Barnyard Millet (Bhagar), Foxtail millet (Kangi), Amaranth (Rajgira), Red sorghum (Chikani), Finger millet (Nachani), and White sorghum (Dadar). In addition to being a wholesome dietary source, millets offer several health advantages. As gluten-free grains, they are an excellent alternative for individuals with gluten sensitivity or celiac disease. Furthermore, millets have a low glycemic index, making them an ideal food choice for diabetics. Each cultivar has distinct nutritional compositions and applications. Farmers often adapt millet seeds from their own crops; hence, preserving seed purity and produce quality necessitates the accurate classification of different millet cultivars. However, the classification of millet cultivars is a complex and time-intensive process. Automation in millet cultivar classification can significantly enhance accuracy and efficiency. This study focuses on the effective classification of eight different millet cultivars using machine-learning classifiers and image-processing techniques based on extracted color features.
Keywords:Agriculture, Image processing, Feature extraction, Classification, Machine learning

Tracing Performance Trends of Self-Help Groups Across India: A Social Computing Analysis

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Abstract— Self Help Groups (SHGs) are voluntary associations of economically disadvantaged individuals, primarily rural women in India, who come together to overcome poverty and address community issues through self-reliance and collective action. This paper endeavors to scrutinize the impacts of savings and loan disbursement on the Non-Performing Assets (NPAs) of banks concerning SHGs. The study seeks to identify the performance of SHGs in India over time, using appropriate social computing analytical methods, specifically during 2007-08 to 2022-23 across six regions of India, namely, central, eastern, northeastern, northern, southern, and western India. Initially summary statistics on the chosen variables have been calculated. For the purpose of analysis, panel data regression analyses have been used, prior to which test for stationarity of the variables of interest have been conducted and test for co-integration have been performed. Hausman test has been used to choose between random effects and fixed effects models. All variables have been found to be stationary at first difference and the presence of cointegration has been supported. Hausman test gave evidence in favour of random effects model. The analysis reveals that NPAs are the most volatile variable, followed by loan disbursement and savings per SHG. Interestingly, the study concludes that loan disbursement and savings have a detrimental effect on NPA growth concerning SHGs. There is a need for financial institutions to develop effective mechanisms for managing the credit risk associated with lending to SHGs, while also supporting their efforts to improve their economic situation.
Keywords: Self-Help Groups, Loan Disbursement, Savings, Non-Performing Assets

Deep Learning Applications for Detecting Crop Diseases from Image Data

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Abstract— In order to optimize the productivity of crops and ensure food security the crop diseases should be identified as soon as possible. In this study, we study the image based crop disease identification using Deep Learning Methods. However, the traditional illnesses detection techniques are typically based on specialist knowledge and human inspection, and the latter also has the disadvantages of being very time consuming and error prone. Use of convolutional neural networks (CNNs), in particular, have made deep learning powerful for many imaging problems such as precise and automated identification of disease. The ultimate goal of this research is to build a CNN based model which, through the analysis of photos of a damaged leaf, can identify and categorize various crop diseases. With this large data set with excellent images of both healthy and sick crops, we take advantage of. The model is trained and tested based on F1 scores, accuracy, precision and recall. The findings indicate that the model proposed in this research outperforms generic machine learning techniques in diagnosing diseases such as rust, mildew, and blight at high accuracy. The real time implementation of the system is also scalable enough to monitor big areas in the smart farming set up. I show in this study that deep learning has the potential to significantly enhance agricultural disease management and to pave the way to new and more effective and sustainable ways to grow crops.
Keywords: Deep learning, crop disease detection, image data, convolutional neural networks, smart farming.

CNN-DBO: Dung Beetle Optimization based Urban Area Change Detection using Satellite Images

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Abstract—In recent years, Geographic Information Systems (GIS) have garnered a significant deal of interest for their ability to detect changes in metropolitan areas. One of the uses of change detection in satellite photographs is in the field of urban planning. Other applications include environmental monitoring and remote surveillance. A number of different approaches have been suggested in recent times for the purpose of automatically identifying alterations in the land cover based on GIS photographs. However, due to poor texture, cluttered context, and consider able object scale disparities, the convolutional neural network (CNN) method is only partially successful in capturing the context from geographic information systems(GISs).This is despite the fact that it remains an effective method for detecting change in urban environments. The article presents the construction of a CNN-based change detection model using the utilization of Dung Beetle Optimization (DBO). The DBO algorithm is used to adjust the loss parameter in order to increase the overall performance. The approach that was proposed makes use of the Onera satellite data set and displays an overall accuracy of 97.50% percent. Inlight of this, it appears that the strategy that is proposed is both very efficient and effective.
Keywords:CNN, GIS, Satellite Images, DBO

Machine Learning Algorithms for Autonomous Underwater Vehicle (AUV) Navigation

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Abstract— Autonomous underwater vehicles (AUVs) play an extremely important role in the fields of oceanography, marine science and underwater infrastructure assessment. Ofcourse, underwater navigation isn't easy either due to varying ocean currents, limited vision, and there's no GPS. This article uses machine learning techniques to describe how AUV navigation can be improved in underwater environments with unknown environment, then enable more reliable decision making and real time obstacle avoidance. This thesis investigates many ML approaches for route planning, sensor data fusion, and obstacle detection including supervised, unsupervised learning and reinforcement learning. With great significance, reinforcement learning algorithms can optimize trial and error learning based navigation techniques to be adapted to novel situations. Additionally, deep leaning algorithms combined with data from sensors such as sonar and cameras are able to enable precise underwater landscape perception and mapping. We apply these algorithms to virtual and physical AUV missions and demonstrate that they result in significant increases in navigation precision, energy efficiency, and mission time. This research's careful consideration of the potential of machine learning for transforming AUV navigation makes more intelligent and autonomous underwater operations possible in many marine sectors.
Keywords: Autonomous Underwater Vehicles, Machine Learning, AUV Navigation, Reinforcement Learning, Obstacle Detection.

A Transparent Diagnosis Model for Diabetic Retinopathy Using Explainable AI

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Abstract—Diabetic retinopathy is the leading cause of vision problems and partial blindness, and its signs are complicated and variable, making detection difficult. Standard diagnosis is mainly reliant on expert interpretation of retinal images, which can lead to bias and mistake, highlighting the need for improved diagnostic approaches. Despite the fact that conventional AI technologies considerably improve diagnostic skills, their black box aspect limits healthcare practitioners' confidence and optimizes their usage in practice. Grad-CAM++ is a new technique that addresses the black box problem by improving model knowledge, allowing users to grasp the reasoning behind specific decisions. Using XAI approaches, this work creates a diagnostic model for diagnosing diabetic retinopathy, hence improving transparency. The proposed model's convergent plots validate the learning process, which results in 94.4% better diagnostic precision than previous approaches.
Keywords: diabetic retinopathy, artificial intelligence, Gradient-Weighted Class Activation Mapping (Grad-CAM++), convolutional neural network.

Collaborative and Integrated Platform to Support Distributed Manufacturing System Using a Service-Oriented Approach Based On Cloud Computing Paradigm

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Abstract— Increasing interest in distributed manufacturing systems is a result of the dynamic nature of today's business environment and with that comes the popularity of their use. This has given rise in the interest in distributed manufacturing systems. The indirect consequence of this has led to much higher use of distributed manufacturing systems. A large number of production processes, dispersed across a multitude of locations geographically separate, must be controlled and integrated in order to achieve production agility, flexibility and efficiency of costs. In our most recent project, we developed an integrated, collaborative manufacturing platform, the centerpiece of which was LAYMOD. To address the issues posed by such systems, this research presents a collateral and integrated platform based on a service oriented approach that can operate within the cloud computing paradigm. These systems present problems which the study is conducted in order to solve. Utilising the features of cloud computing, it aims to serve as a platform in solving process coordination and hence improving efficiency and scalability of distant manufacturing processes and potential real time communications among various stake holders. Furthermore, statistical research on the rates of platform module adoption in different settings provides specifics of (a) use patterns of some platform modules and (b) what capabilities are provided by some platform modules. When extrapolated to a wider size, our work is applied towards the creation of collaborative and integrated platforms for a number of the various manufacturing processes which are currently in use.

Keywords: Distributed Manufacturing, Cloud Computing, Service-Oriented Architecture, Collaboration, Integration, Scalability, Resource Optimization, Real-Time Communication, Competitiveness

Spectrum Sensing Techniques in Cognitive Radio based Wireless Regional Area Network: A Review

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Abstract—With the advancement in wireless communication technology, the demand for wireless devices has also increased. Spectrum is the heart for wireless communication so there is a huge demand for it to support these wireless devices. The approach adopted in Cognitive Radio (CR) to locate the unoccupied bandwidth is called spectrum sensing. On successful spectrum sensing, other additional functions of the cognitive radio can be accomplished. Effective spectrum sensing is therefore the main requirement of cognitive radio. Spectrum sensing approaches and problems are discussed in this study. A research-based summary of the framework of cognitive radio is provided. The ideas of cooperative spectrum sensing and their categories are explained in this study. We also investigated spectral scanning mechanisms in the IEEE protocols.

Keywords: Cognitive radio, Spectrum sensing, Wireless Regional Area Network, Cooperative spectrum sensing

Impact of Cryptocurrency on Global Financial Stability: Analyze Regulatory Responses and Their Effectiveness in Managing Risks Associated with Cryptocurrencies

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Abstract-Crypto currencies are rapidly developing into the financial systems all over the world and, therefore, can be regarded as alarming authorities and financial supervisory agencies. This paper focuses on the complex relationship between the increasing use of crypto currencies and the fluctuations of the world economy. It explores the industry's fundamentally low relative volatile nature that includes crypto currencies, risks of hacking attacks, frauds and money laundering that disrupt classical economical system frameworks. The emphasis is made on the regulatory activity in various areas, evaluating the efficiency of these measures in minimizing the identified risks. Thus, based on the analysis of the regulatory frameworks of the countries, which have different economic conditions and the level of using crypto currencies, those should be defined, which are successful and which difficulties may be encountered at the legislative level. Therefore, the results indicated that while some measures of regulations, which have been implemented in order to increase both market transparency and investors' protection, proved to be effective, others have been consistently failing to adapt to the fast-growing phenomenon of digital currencies. At the end of the paper, the author presents a set of proposals concerning a comprehensive international regulation that should take into account the peculiarities of the examined phenomenon while providing a proper balance between creation and constraint. This paper adds to literature on financial stability and presents findings regarding the strategies that need to be adopted to create sound policies to tackle the challenges of the cryptocurrency market.

Keywords: Bitcoins, fiscal systems, Digital currencies, Economic systems, cross-border

AI-Powered Object Detection for Autonomous Vehicles: A Comparative Study of Machine Learning Models

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Abstract—Object detection is a critical component of autonomous cars, enabling them to understand their surroundings and make safe, real-time driving decisions. This research evaluates and compares multiple machine learning models for object identification in autonomous vehicles, focusing on accuracy, computational efficiency, and real-time performance. It examines the performance of various well-known models, including CNN, YOLO, SSD, and R-CNN, under different driving conditions. The study explores the models' capabilities for real-time applications in autonomous cars and analyzes the trade-offs between speed and accuracy. Additionally, it investigates the effects of hyperparameter adjustments, data augmentation, and transfer learning on the performance of these models. Through extensive research on benchmark datasets, the study highlights the advantages of adopting hybrid models that balance speed and accuracy to improve object recognition in real-world scenarios. This work contributes to the growing body of knowledge on AI-driven solutions for autonomous systems by providing valuable insights into enhancing object identification algorithms for autonomous vehicles.

Keywords: Autonomous vehicles, object detection, machine learning, real-time performance, comparative analysis.

Revolutionizing Skin Cancer Detection Merging CNNs with Vision Transformers

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Abstract—Skin cancer is one of the top health concerns globally, and early detection is essential to ensure good patient outcomes. Earlier research studies have applied CNNs or Vision Transformers separately, and CNNs outperform on local feature extraction, whereas ViTs are more successful in capturing global dependencies. However, such isolated techniques suffer from limitations such as lower accuracy on heterogeneous datasets and poor generalization. This work bridges this gap by introducing a hybrid model that synergizes the strengths of both architectures. The CNN extracts low-level details like textures and edges, while the ViT captures spatial relationships across the image. Evaluated on open-source skin cancer datasets, the proposed model outperforms individual approaches in accuracy, reliability, and generalization, making it a robust tool to assist dermatologists in early stage diagnosis.

Keywords:CNN, Vision Transformer, Image classification.

Image Recognition for Wildlife Conservation

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Abstract—This study adopts an empirical approach to evaluate the efficacy of image processing methods in conservation efforts for animals. The initial phase involves the collection of data from various sources within the natural ecosystem, including images captured through camera traps, drones, and other monitoring devices. This comprehensive and diverse dataset is then processed using advanced Image Processing Tools. A key strength of this methodology lies in its use of Machine Learning algorithms, particularly YOLO v8 (You Only Look Once) and Support Vector Machines (SVMs). These techniques are suitable for wildlife conservation because of their capacity to analyze complex visual data and detect patterns indicative of species presence, behavior, and habitat conditions. The paper outlines the application of YOLO v8 and SVMs to the collected image data, enabling accurate identification, real-time detection, and classification of wildlife species. This capability is essential for monitoring populations, tracking movements, and identifying potential threats, thus facilitating timely conservation actions. Furthermore, the research extends its evaluation by comparing the results of the Machine Learning approach with traditional ecological survey methods, offering a comprehensive assessment of the effectiveness of image processing in wildlife conservation.

Keywords: YOLO v8, SVM, Image Processing, Wildlife Conservation.

Securing Wireless and Optical Networks: Advanced Strategies for Network and Information Security in Modern Communication Systems

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Abstract—In the era of rapidly changing communication systems, securing wireless and optical networks has become of essence to protect sensitive data and ensure operation. This study addresses network and information security in current communication systems by studying cutting edge techniques to enhance network and information security in wireless and optical networks. The wireless networks are convenient and may be moved around, but they are also prone to hacking, illegal access or some other cyber attacks. As optical networks possess both a large capacity and relatively low latency, it is not without special security issues such as fibre tapping and signal jamming. This study presents detailed analyses of state of the art authentication techniques, intrusion detection systems (IDS), and encryption algorithms specifically designed for these networks. Then there are, such as Quantum Key Distribution (QKD) which almost assuarly unbreakable techniques are examined alongside conventional cryptographic methods. Additionally, anomaly detection based on machine learning is explored for real time threat identification in optical and wireless channels. It stresses the need of the cross domain solutions and multi layered security frameworks covering the network layer and the physical security measures. Through case studies and recent developments in cyber threats and network resilience, this article provides a thorough understanding of how these tactics could be used to make networks such as wireless network and optical network more resilient against increasing cyber risks.
Keywords: Quantum Key Distribution (QKD), Machine Learning for Intrusion Detection, Post-Quantum Cryptography, Wireless Network Security.

Personal AI Trainer Using Two-WayMirror and Raspberry Pi

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Abstract—A novel smart mirror system is proposed to enhance users' daily routines by integrating advanced technologies. Utilizing a Raspberry Pi, an electronic display, a two-way mirror, a camera, and control mechanisms powered by OpenCV and MediaPipe, the system provides personalized interactions through facial recognition. This feature allows the smart mirror to identify users and tailor its responses accordingly. Beyond its aesthetic appeal, the system functions as an interactive fitness coach, guiding users through workouts, correcting their form, and delivering real-time feedback. This paper explores the potential of smart mirrors to revolutionize personal fitness and care, offering an innovative approach to interactive user engagement.
Keywords: smart mirror, Raspberry Pi, MediaPipe, OpenCV, fitness.

Cylindrical dielectric resonator antenna for 5G,6G, and mmWave Application

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Abstract— The proposed high-gain rectangular Dielectric Resonator Antenna (DRA) is optimized for X, K, and Ka bands with a defective ground structure (DGS) and micro strip feed, enhancing impedance matching, current distribution, and bandwidth. A defective ground structure (DGS) featuring strategically placed circular and rectangular cuts, improves impedance matching, controls current distribution, and enhances bandwidth. It contributes to these enhancements by optimizing power transfer. the operating frequencies of 18.3GHz, 27.2GHz, and 35GHz, and covering a bandwidth of 12.5-21.42GHz its S11=44.2dB ,25.1-29.8GHz its S11=17.2dB and 31.4-36.6GHz its S11=24.2dB, where good impedance matching is evident. It covers bandwidths of 48.47%, 17.27%, and 14.85% respectively. Gain of 7.8 dB, 8.22 dB, and 8.12 dB. The radiation efficiency was more than 94.82%, 96.52%, and 98.81% respectively, it is ideal for applications like satellite communications, radar, and high-frequency wireless systems.
Keywords:DRA, DGS, gain, efficiency, and bandwidth.

Autonomous Vehicle Navigation Systems: Machine Learning for Real-Time Traffic Prediction

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Abstract— By making transportation safer and more efficient, autonomous vehicle navigation systems are transforming the transportation industry. Autonomous cars are able to make route selections based on accurate, up-to-the-minute traffic predictions, which help them avoid congestion and maximize their trip time. The use of machine learning algorithms to reliably forecast traffic conditions in real time for use in autonomous vehicle navigation is the focus of this research. Deep learning, support vector machines, and random forests are just a few examples of the machine learning models that can accurately forecast traffic conditions by mining massive datasets collected from GPS data, traffic sensors, and past trends. The suggested method incorporates these models into an autonomous vehicle navigation system that operates in real-time, enabling adaptive modifications according to the flow of traffic. We also look at how things like construction, road accidents, and weather affect the precision of traffic predictions. Based on the outcome of decreased trip time, increased safety and efficiency, results demonstrate how navigation systems supplemented with machine learning, far surpass conventional routing approaches. The study suggests that further research needs to be conducted on hybrid algorithms for better traffic prediction, and multi modal data integration to further optimize autonomous vehicle navigation and in general, machine learning presents great promise in this area.
Keywords: Autonomous vehicles, machine learning, real-time traffic prediction, navigation systems, traffic optimization.

Leveraging EfficientNet-B0 for Soybean Leaf Disease Detection: A Deep Learning Perspective

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Abstract—Plant diseases require quick and accurate identification methods since they significantly reduce agricultural production's output and quality. Traditional methods of plant protection, which depend on visual assessment of pests and diseases that impact soyabean plants, have long turnaround times and variable accuracy. A critical need as the demand for precision agriculture grows is the creation of quick, effective, and—above all—computer-aided disease recognition systems. This study proposed convolutional neural network-based classification model for soyabean leaf. Proposed model can detect nine different types of soyabean diseases. Our transfer-learning based model classifies soybean leaves using a Inception B0 convolutional neural network, and on unseen testing data, we obtain balanced accuracies between 91.11% and 96.44%.The result of proposed model is generated on 3000 different images of soyabean leaves and classify nine different types of soyabean diseases.
Keyword:Inception B0, Transfer Learning, CNN, Soyabean, Deep Learning, Machine Learning, Agriculture

Cybersecurity with Blockchain: Strengthening the Privacy and Security of Data in Internet of Things Networks

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Abstract —The explosion of Internet of Things (IoT) devices has changed the way people interact with technology by making data-driven decisions and smart environments feasible. The exponential growth in the number of linked devices has also increased the attack surface for cyber assaults, leading to significant concerns about the privacy and security of Internet of Things networks. Conventional security measures aren't always up to the task of dealing with the unique challenges posed by the Internet of Things (IoT), such as resource scarcity, unpredictable network topologies, and the generation of massive volumes of data. Increasing the cybersecurity posture of Internet of Things networks is the focus of this research, which investigates the possibility of incorporating blockchain technology as a promising solution. We propose a novel design that leverages the immutability, decentralization, and data encryption features of blockchain technology to secure data from the Internet of Things (IoT). Using smart contracts to automate security protocols, the framework creates a trustless environment where Internet of Things devices can securely share information. We analyze common Internet of Things weaknesses such as the framework's ability to prevent data modification, unauthorized access. We undertake a detailed examination of the performance of the framework. All things considered, our research shows that the blockchain-based approach greatly improves the privacy and security of IoT data. Decentralized consensus methods fortify the system against weak points, and an immutable ledger ensures that all data transfers are secure. Access control and authentication procedures are simplified by the utilization of smart contracts, which in turn reduces the likelihood of unauthorized data breaches occurring. Both the scalability and processing overhead concerns that are involved with the application of blockchain technology in Internet of Things networks are addressed by this research. We offer optimization methods to overcome these challenges, so the suggested framework will remain functional and beneficial for Internet of Things applications in the actual world. This research provides strong evidence in support of using blockchain technology to secure Internet of Things networks. The proposed architecture not only strengthens the cybersecurity infrastructure, but also allows for the creation of more private and secure Internet of Things applications. Findings from this study add to the continuing efforts to safeguard the digital environment against cyber threats that are always developing.
Keywords: Data Security, Data Privacy, Smart Contracts, Decentralization, Immutability, Cryptographic Security.

Natural Disaster Prediction Using Deep Learning

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Abstract—Accurate prediction techniques are essential in an era when natural disasters pose severe dangers to human lives and infrastructure. This article presents a deep learning approach that uses convolutional neural networks (CNNs) to anticipate natural disasters such as floods, earthquakes, wildfires, and storms. The work preprocesses a dataset of 4,429 pictures using scaling, normalization, and augmentation techniques (such as flipping and rotation) to ensure model resilience and diversity in the data. The image sets were separated into training, validation, and test sets to optimize model performance. Several CNN architectures were used to train the model, including Xception, VGG16, and MobileNet. The testing results showed that MobileNet outperformed the other models with a test accuracy of 92.25%. VGG16 finished second with 91.50%, while Xception achieved 91.00%. A thorough performance assessment was produced by examining these models according to precision, recall, and F1 score. The impressive outcomes, especially for MobileNet, are ascribed to its capacity to effectively extract salient characteristics from the pictures, like distinct patterns and textures connected to different kinds of calamities. The study's overall findings demonstrate that CNN-based models can make precise predictions about natural disasters in real-time situations. To improve early warning systems, the models in this work indicate a high degree of accuracy by merging image data from satellite sources and using advanced data augmentation techniques. The results show how deep learning can practically enhance emergency preparedness and response procedures.

Keywords:Cyclones, Earthquakes, Floods, Wildfires, Environ- mental Data, Image Classification, Pattern Recognition, Disaster Preparedness, Prediction Accuracy, Machine Learning, Natural Disaster Prediction, Deep Learning, Convolutional Neural Net- works (CNN), Satellite Imagery, Disaster Management.

Comparison of Convergence Rates in Federated Learning and Federated Multi-task Learning Using the CIFAR-10 Dataset

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Abstract—Many smart or cell phones have built-in distance, signal, and air pollution sensors. While collecting information, an acceleration registering device is a three-dimensional one and it can be applied in the gait analysis to address issues such as falls and health status determination. Indeed, the data is abundance in terms of quantity and some of the data may be of great concern in terms of privacy. In the time of Industry 4.0 the data has emerged as a key resource. Personal information/identity must not be maintained and hence cannot be stored at one place or all collected in a single place. AI models are moving to decentralized where a machine learning setting called Federated learning (FL) is being applied. FL has adversities such as statistical and systems heterogeneity. Actually, to better use shared information and build local models, Federated Multi-task learning (FMTL) has been devised. We also compare the number of iterations required to converge using CIFAR dataset of FL and FMTL. Several graphs illustrated in this paper show that convergence rates depend on the algorithm, number of communication rounds and number of clients or devices. Thus, it is clear that in some cases FL outperforms with FMTL in terms of convergence or conversely. However, it cannot be deduced that the type of FMTL always converges better than FL. The reliance on this graph is evident in this paper in order to as explain as prove the fact that, as the number of clients in FL rises, the rate of convergence declines. If ten communication rounds are employed with the use of the MOCHA algorithm, the model does not converge appropriately. The RMSE score declined from 1.14 to 1.02 throughout 20 epochs.

Keywords:Federated Learning, Federated Multitask Learning, data center, convergence, shared model, statistical challenges, localized model.

Bi-GRU and Glove based Aspect-level Movie Recommendation

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Abstract—This study investigates the effectiveness of deep learning architectures for sentiment analysis in text-based data. The methodology begins with data collection, where movie reviews sourced from IMDbare utilized, reflecting a variety of emotional expressions. The dataset undergoes preprocessing, which includes tokenization, embedding using GloVe, and split- ting into training and testing sets, with 80 allocated for training and 20 for testing to ensure reliable model evaluation. The models implemented in this study include GRU with GloVe embed- dings, BiGRU with GloVe embeddings, and LSTM with GloVe embeddings. Each model is constructed to capture sequential dependencies in the text, allowing for anuanced understanding of sentiment. The models are compiled with appropriate optimizers and loss functions, and their performance is evaluated using accuracy, precision, and recall metrics. During the testing phase, the trained models are assessed based on their ability to classify sentiments effectively, generating in sights into their performance. The results are visualized to highlight misclassification and areas for improvement. This methodology streamlines the sentiment classification process, reducing reliance on manual analysis and enhancing overall efficiency. The findings demonstrate that deep learning models can significantly improve sentiment analysis accuracy, providing valuable insights for future research in emotion detection within Natural Language Processing (NLP) applications.

Keywords: LSTM, GRU, Bi-GRU, GloVe.

AI-Driven Solutions for Predictive Maintenance in Smart Transportation Systems

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Abstract—Predictive maintenance: A game changer in infrastructure and vehicle management, and able to cut maintenance expenses and downtime of smart transportation systems. This study explores ways in which smart transportation systems might use AI in order to plan maintenance schedules and forecast equipment breakdowns. Predictive algorithms, that can detect potential problems before raising to expensive repair or system breakdown, use real time sensor data from infrastructure and vehicles. Decision trees and neural networks are two of these models. By allowing AI driven solutions, transportation systems may transition from a reactive to a proactive maintenance practice which may support efficiency, safety, and reliability. Unsupervised learning methods are used to do anomaly detection for real time operations, and we examine the patterns in previous maintenance data with supervised learning approaches. The use of AI for predictive maintenance is also being studied for use in smart cities, where transportation networks are becoming more interconnected by IoT. The paper also considers challenges on data integration as well as the importance of scaling the algorithms and guaranteeing cybersecurity in these systems. Based on our research, smart transportation systems could benefit from AI to increase operational efficiency, reduce the cost of material and labor to maintain and repair equipment systems, and decrease the rate of disruptions.

Keywords: AI, Predictive Maintenance, Smart Transportation, Machine Learning, IoT.

Advanced Nodal Pricing and Optimization Techniques for Integrating Renewable Energy in Electricity Markets

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Abstract—This study explores advanced nodal pricing strategies in electricity markets, aiming to enhance efficiency, sustainability, and resilience. Nodal pricing, which assigns prices to specific locations based on supply and demand conditions, is critical for managing modern electricity grids, especially with increasing renewable energy integration. The objectives of this research include examining the effectiveness of dynamic pricing models, assessing the impact of renewable energy sources on pricing, and evaluating optimization techniques for cost reduction and efficient resource allocation. Key findings from the MATLAB simulations reveal that dynamic pricing models effectively manage demand and supply, reducing peak loads by 15% and incentivizing off-peak usage. Renewable energy integration, contributing 40% of the total demand, significantly reduces reliance on conventional generation, lowering overall system costs and emissions. However, the intermittent nature of renewables introduces price volatility, necessitating advanced storage solutions. Optimization techniques, incorporating machine learning and advanced algorithms, reduce system costs by 10% and ensure optimal dispatch of generation resources, prioritizing renewables while managing transmission constraints. These findings underscore the importance of adopting advanced nodal pricing strategies in achieving a balanced, cost-effective, and sustainable electricity market. Future work should focus on refining these strategies to adapt to the evolving energy landscape and technological advancements.
Keywords:Dynamic pricing, electricity market, nodal pricing, optimization techniques, renewable energy, sustainable energy.

Metaheuristic Approaches in Path Finding and Optimization

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Abstract—Navigation planning is a critical component in the operation of mobile systems such as robots, autonomous vehicles, and unmanned aerial vehicles (UAVs). As the complexity of these systems increases, the need for robust and efficient pathfinding algorithms becomes more significant. Traditional heuristic approaches often struggle in dynamic environments, prompting the adoption of metaheuristic algorithms inspired by natural phenomena. This study evaluates five widely used metaheuristic algorithms: Ant Colony Optimization (ACO), Artificial Bee Colony (ABC), Firefly Algorithm (FA), Moth Flame Optimization (MFO), and Tabu Search (TS). The performance of these algorithms is compared across multiple scenarios, including static shortest-path calculations, the Traveling Salesperson Problem (TSP), and randomized environment. Results indicate that ACO consistently identifies optimal paths but incurs relatively high computational time. Tabu Search offers a balanced trade-off between computational efficiency and solution quality, while ABC delivers suboptimal paths with faster execution times. In contrast, MFO and FA exhibit excessive exploration, leading to higher costs and inefficiencies in specific scenarios.
Keywords: MetaHeuristic, Path finding, Optimization