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RAMSITA
Recent Advancement and Modernization in Sustainable Intelligent Technologies & Applications
Annual Conference 2026

CSIT
COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

CY
DEPARTMENT OF CYBER SECURITY

2nd International Conference on

Recent Advancement and Modernization in Sustainable Intelligent Technologies & Applications (RAMSITA-2026)

February, 06-07, 2026

INSIGHTS

Book of Abstracts

Organized by

Department of CSIT & CSE (CY)
Acropolis Institute of Technology and Research, Indore, MP, India

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Preface

The Book of Abstracts, INSIGHTS, is a scholarly compilation of the research contributions presented at the **2nd International Conference on Recent Advancements and Modernization in Sustainable Intelligence Technologies & Applications (RAMSITA-2026)**, to be held on 6–7 February, 2026 at Acropolis Institute of Technology and Research, Indore, MP, India. This volume provides a concise yet comprehensive overview of the innovative ideas, methodologies and findings shared during the conference.

RAMSITA-2026 serves as an interdisciplinary platform that brings together academicians, researchers, industry professionals and practitioners to exchange knowledge in emerging areas such as Artificial Intelligence, Intelligent Systems, Cyber Security, Data Analytics, Internet of Things, Sustainable and Green Computing and related domains. The abstracts included in this book reflect the diversity, relevance and contemporary significance of research aimed at addressing real-world challenges through sustainable and intelligent technological solutions.

All abstracts published in INSIGHTS correspond to papers that have undergone a rigorous peer-review process and have been accepted for presentation at RAMSITA-2026. This book is intended to act as a quick reference for conference participants, researchers and readers, enabling them to identify research trends, explore potential collaborations and gain insight into the thematic focus of the conference.

It is important to note that proceedings of conference will be published in ATLANTIS PRESS (part of Springer Nature Group) under the open-access proceedings series Advances in Intelligent Systems Research. This Series will be indexed in CNKI, Dimensions, EBSCO Discovery Service, INSPEC, Google Scholar, Naver, OCLC WorldCat Discovery Service, ProQuest-ExLibris Primo, ProQuest-ExLibris Summon, TD Net Discovery Service, Wanfang Data. Also, selected titles will be submitted for evaluation in CPCI (part of Clarivate's Web of Science, Subject to acceptance).

Furthermore, selected and extended versions of high-quality papers will be invited for consideration in Scopus-indexed journal BJIT – International Journal of Information Technology, subject to the journal's independent fast track peer review and approval process.

We hope that this Book of Abstracts serves as a valuable academic resource and a source of inspiration for future research and collaboration in the field of sustainable intelligent technologies.

Acknowledgment

As the Conference Organizers, it is our profound pleasure to express our sincere gratitude to all individuals and institutions whose invaluable contributions and unwavering support have made the Book of Abstracts, INSIGHTS, of the **2nd International Conference on Recent Advancements and Modernization in Sustainable Intelligence Technologies & Applications (RAMSITA-2026)** a meaningful and successful scholarly compilation.

We extend our heartfelt appreciation to all the authors for their original research contributions and enthusiastic participation. Their scholarly work forms the foundation of this Book of Abstracts and reflects the academic rigor, innovation and interdisciplinary spirit of RAMSITA-2026.

We sincerely acknowledge the dedicated efforts of the reviewers for their expert evaluation, constructive feedback and timely reviews, which ensured the quality, originality and integrity of the accepted abstracts and papers. Our gratitude is also extended to the distinguished keynote and invited speakers for sharing their knowledge, insights and experiences, which significantly enriched the intellectual value of the conference.

We gratefully acknowledge the support and cooperation of our sponsors and partners, whose encouragement and contributions played an important role in the successful organization of the conference and its academic activities.

Our sincere thanks are due to the esteemed members of the Advisory Committee and Technical Program Committee for their guidance, strategic direction and continuous support throughout the planning and execution of RAMSITA-2026.

We always admire the unconditional support, encouragement and trust from Management especially Shri Gaurav Sojatia, Chairman, Acropolis Institute of Technology and Research, Indore, during the conference. His minute observations played important role in improving quality of the conference.

We would like to place on record our special and heartfelt gratitude to the Dr. Shashi Chandra Sharma, Director, AITR, for unweaving support all time and any time. His visionary leadership, institutional backing and commitment to academic excellence provided the necessary impetus to successfully organize RAMSITA-2026 and publish this Book of Abstracts, INSIGHTS.

Finally, we acknowledge the dedicated efforts of the organizing team, faculty members, staff and student volunteers, whose teamwork and commitment ensured the smooth conduct of the conference.

RAMSITA-2026 Team

Messages

Chairman BOG

Er. Ashok Sojatia

It is with immense pride and honor that **Acropolis Institute of Technology and Research (AITR)** announces its readiness to host the prestigious **2nd International Conference on Recent Advancements and Modernization in Sustainable Intelligent Technologies & Applications (RAMSITA-2026)**. Building upon the success of previous editions, RAMSITA-2026 aspires to further strengthen collaboration among academicians, researchers and industry professionals by addressing contemporary challenges and showcasing innovative, sustainable solutions in the rapidly evolving domain of intelligent computing and technologies.

In today's fast-paced technological era, sustainability has become a fundamental pillar of responsible innovation. RAMSITA-2026 places strong emphasis on the integration of sustainable practices within intelligent technologies, encouraging participants to explore forward-looking solutions that not only drive technological progress but also respond to pressing global environmental and societal concerns. The conference aims to serve as a vibrant platform that bridges academia and industry, enabling knowledge exchange, exposure to cutting-edge research and the promotion of ethically grounded and sustainable technological development.

I extend my sincere gratitude to all invited speakers, authors, scholars, reviewers and participants for their valuable contributions and enthusiastic involvement. I am confident that RAMSITA-2026 will emerge as an inspiring forum for meaningful discussions, collaborative research and impactful innovation, leaving a lasting impression on everyone associated with the event.

I convey my best wishes for the grand success of **RAMSITA-2026** and look forward to its significant contributions toward sustainable and intelligent technological advancement.

Group Chairman

Er. Ashish Sojatia

It is a privilege to be associated with the academic initiative undertaken by Acropolis Institute of Technology and Research through the organization of the **2nd International Conference on Recent Advancements and Modernization in Sustainable Intelligent Technologies & Applications (RAMSITA-2026)**. The conference represents a continuation of the meaningful academic dialogue initiated during RAMSITA-2025, which achieved notable success in bringing together researchers and practitioners to deliberate on sustainability-oriented technological progress.

The evolving landscape of intelligent computing, data-driven systems and artificial intelligence calls for research that is not only innovative but also socially and environmentally responsible. RAMSITA-2026 aims to encourage such thoughtful exploration by providing a platform for sharing original research, exchanging perspectives and examining practical approaches that support sustainable development in modern computing paradigms.

The second edition of the conference reflects a growing commitment to fostering collaboration across academia and industry while strengthening research quality and global engagement. I commend the efforts of the organizing committee, contributors and reviewers whose dedication has helped shape this scholarly forum.

I send my heartfelt wishes to all participants and wish **RAMSITA-2026** a productive outcome, enriching discussions and lasting academic impact as it builds upon the achievements of its inaugural edition.

Chairman

Er. Gaurav Sojatia

In today's data-driven era, educational institutions bear the responsibility of nurturing thoughtful innovators who can respond effectively to rapid technological evolution. As **Artificial Intelligence (AI) and Intelligent Systems** increasingly influence decision-making, automation and digital ecosystems, academia must guide the development of technologies that are ethical, sustainable and socially beneficial.

Inspired by the intellectual achievements and research momentum of RAMSITA-2025, the **2nd International Conference on Recent Advancements and Modernization in Sustainable Intelligent Technologies & Applications (RAMSITA-2026)** is envisioned as a global forum for advancing discourse on responsible innovation. The conference encourages research that integrates AI-driven solutions with sustainability principles, ensuring that technological progress remains aligned with long-term environmental and societal goals.

Acropolis Institute of Technology and Research continues to promote a vibrant research culture that supports interdisciplinary collaboration and purposeful use of emerging technologies. Through this conference, scholars and practitioners are invited to explore how intelligent systems can be designed and deployed to address real-world challenges while maintaining transparency, accountability and ecological awareness.

I encourage all participants to engage actively, exchange ideas and contribute to discussions that shape a future where artificial intelligence and intelligent technologies serve humanity with responsibility and vision. I extend my best wishes for a productive, insightful and impactful **RAMSITA-2026.**

Secretary

Shri Anand Sojatia

It is heartening to note that Acropolis Institute of Technology and Research continues its academic journey with the organization of the **2nd International Conference on Recent Advancements and Modernization in Sustainable Intelligent Technologies & Applications (RAMSITA-2026).** The conference carries forward the strong academic legacy of RAMSITA-2025, whose success reflected active participation, quality research contributions and meaningful scholarly engagement.

As intelligent computing, artificial intelligence and data-driven innovations increasingly shape modern society, such international forums play a crucial role in encouraging responsible research and sustainable technological progress. RAMSITA-2026 offers an important platform for researchers, educators and students to explore emerging directions, share innovative ideas and discuss challenges related to sustainable and intelligent technologies.

I sincerely appreciate the dedication and vision of the organizing committee and all contributors who have worked toward making this conference possible. I am confident that the second edition will further strengthen academic collaboration, inspire new research initiatives and create lasting professional connections.

I convey my earnest wishes for the continued success of **RAMSITA-2026** and congratulate the entire team for building upon the achievements of its inaugural edition

Vice Chairman

Prof. M. K. Dube

Acropolis Institute of Technology and Research, Indore, is delighted to present the **2nd International Conference on Recent Advancements and Modernization in Sustainable Intelligent Technologies & Applications (RAMSITA-2026)**. The conference expands on the outstanding outcomes of RAMSITA-2025, marked by active engagement from academicians, researchers and industry experts, leading to insightful dialogue and productive research partnerships.

RAMSITA-2026 is envisioned to further elevate the platform by focusing on forward-looking research, sustainable innovation and practical applications of intelligent technologies. The conference aims to promote thoughtful dialogue on emerging technological paradigms while reinforcing the importance of responsible and inclusive development.

In an era defined by rapid digital transformation, forums such as RAMSITA-2026 play a crucial role in bridging academic inquiry with industrial relevance. The conference is designed to inspire knowledge exchange, interdisciplinary cooperation and solution-oriented research that addresses global challenges with sustainability at its core.

We are confident that the presence of eminent delegates, speakers and contributors will once again lead to insightful deliberations and valuable outcomes. I extend my sincere best wishes to the organizing team and all participants for making **RAMSITA-2026** a resounding success, continuing the legacy established by RAMSITA-2025.

Director

Prof. (Dr.) Shashi Chandra Sharma

It is a matter of great pride to present the Book of Abstracts, "INSIGHTS" compiled for the **2nd International Conference on Recent Advancements and Modernization in Sustainable Intelligent Technologies & Applications (RAMSITA-2026)**, organized by Acropolis Institute of Technology and Research. This volume reflects the dynamic and evolving research landscape driven by innovation, sustainability and intelligent systems.

The abstracts featured in this compilation represent significant scholarly endeavors addressing contemporary challenges and emerging opportunities in modern technologies. With a strong emphasis on Artificial Intelligence, data-driven solutions and sustainable digital transformation, the contributions underscore the growing impact of intelligent technologies across research, industry and society.

The successful organization of RAMSITA-2026, along with its enthusiastic participation, reaffirms the conference's expanding international stature as a forum for meaningful academic exchange. Researchers from diverse disciplines have shared original insights and practical approaches, fostering collaboration and promoting knowledge dissemination beyond institutional and geographical boundaries.

I express my sincere appreciation to the authors for their valuable contributions, the reviewers for their scholarly rigor and the organizing team for their dedicated efforts in ensuring the success of the conference and its academic outcomes. I am confident that this compilation will inspire future research and make a constructive contribution to the advancement of sustainable and intelligent technologies.

Conference Chair

It gives me immense pleasure to present INSIGHTS the Book of Abstracts of the **2nd International Conference on Recent Advancements and Modernization in Sustainable Intelligent Technologies & Applications (RAMSITA-2026)**.

Prof. (Dr.) Shilpa Bhalerao

In an era of rapid digital advancement, the world faces critical challenges such as climate change, cybersecurity, ethical AI and digital inequality. Addressing these issues requires sustainable intelligence—technologies that are efficient, ethical, transparent and socially responsible. The research contributions featured in INSIGHTS reflect this commitment, offering innovative and meaningful solutions for a sustainable future.

The abstracts span a wide range of contemporary themes including Artificial Intelligence, Sustainable Computing, Cyber Security, Data Science, Smart Systems, Intelligent Automation and interdisciplinary innovations, all aligned towards building a sustainable and secure future. Each contribution represents thoughtful research efforts aimed at solving real-world problems while balancing technological advancement with environmental and societal responsibilities.

RAMSITA 2026 serves as a global platform to connect academia, industry and research communities to exchange ideas, share innovations and foster collaborations. This Book of Abstracts is intended to offer readers a concise yet powerful glimpse into current research trends and emerging directions in sustainable intelligent technologies.

I am also deeply thankful to all authors for their valuable contributions, the reviewers for their rigorous evaluations and the organizing committee for their dedication and tireless efforts in bringing this second edition to fruition. I would like to express my sincere gratitude to our distinguished keynote speakers, invited speakers and session chairs, whose expertise and insights greatly enrich the conference and inspire meaningful academic discourse.

My special thanks to IIT Ropar, TCS, Asmakam Life University, Dextar and IEEE for their valuable technical sponsorship and continued support, which significantly contributed to the academic quality and success of RAMSITA 2026. I am confident that INSIGHTS will serve as a valuable academic reference and a source of inspiration for researchers, practitioners and academician alike.

I wish all participants a stimulating, insightful and rewarding experience at **RAMSITA 2026.**

Conference Co-Chair

Prof. (Dr.) Praveen Gupta

Prof. (Dr.) Vandana Kate

We are delighted to present this Book of Abstracts "Insights" for the **2nd International Conference on Recent Advancements and Modernization in Sustainable Intelligent Technologies & Applications (RAMSITA-2026).** This volume represents the collective vision, creativity and scholarly commitment of researchers, academicians, industry experts and students who have come together to share ideas that address contemporary challenges and future technological needs.

The strong foundation laid by the successful completion of RAMSITA-25 continues to inspire us. The previous edition witnessed enthusiastic participation, high-quality research contributions and meaningful technical discussions that extended beyond the conference sessions. Encouraged by the positive response, academic impact and collaborative spirit demonstrated during RAMSITA-25, this edition has been thoughtfully structured to further strengthen interdisciplinary engagement and real-world relevance.

"Insights" showcases a rich spectrum of research themes and applications. The conference sessions are designed to highlight practical implementations, real-world applications and case studies that demonstrate how emerging technologies are transforming industries and educational ecosystems. Contributions span cutting-edge domains such as Artificial Intelligence, Internet of Things (IoT), Data Science, Blockchain, Smart Computing, VLSI, 5G and advanced communication technologies, among others. These works reflect innovative thinking, problem-solving approaches and forward-looking perspectives aimed at creating sustainable and intelligent solutions.

This conference is particularly meaningful due to its well-balanced integration of theory and practice. The abstracts compiled here not only present novel methodologies and analytical insights but also emphasize tangible impact—showing how technology can drive efficiency, innovation and social progress across diverse sectors. We hope these contributions encourage thoughtful discussions, inspire new research directions and foster long-term academic and industry collaborations.

We extend our sincere gratitude to the authors, whose dedication and rigorous research form the backbone of this publication. We are equally thankful to the reviewers for their careful evaluation, constructive feedback and commitment to maintaining academic quality. Our heartfelt appreciation goes to the keynote speakers, invited speakers, session chairs and distinguished guests, whose valuable time, expertise and insights have greatly enriched the conference experience.

We also acknowledge the efforts of the organizing and technical committees for their unwavering support and coordination. Their behind-the-scenes work has been instrumental in ensuring the smooth execution of the conference and the successful compilation of this Book of Abstracts.

As Co-Chairs, it has been an honor to be part of this academic journey. We hope that this volume serves not only as a record of research but also as a source of inspiration, collaboration and innovation for years to come.

Speakers

Distinguished Speakers

Dr. Sudarshan Iyengar
Director, ANNAM.AI
IIT Ropar, India

Dr. Sudarshan Iyengar is an educator, researcher and computing enthusiast who strives to make technical education more engaging and impactful through storytelling. A PhD graduate from the Indian Institute of Science (IISc), he has delivered over 400 popular science talks, conducted 120+ Faculty Development Programs and created online SWAYAM/NPTEL courses that have reached over 1 million students. He is a strong advocate for innovative teaching methodologies in higher education. His SWAYAM course The Joy of Computing stands number one in terms of enrollments and attracts close to 75,000 enrollments every semester.

Dr. Sudarshan, a faculty member in the CSE Department at IIT Ropar, is currently on deputation serving as the Director of Annam.AI, a newly established ₹330-crore Center of Excellence in Artificial Intelligence at IIT Ropar. Additionally, he is the Principal Investigator and leads the Education Design Lab at IIT Ropar, where he works on creating novel pedagogical frameworks for the future of learning. He heads a national level FDP initiative Gurusetu of MMTTP which is meant to up-skill 15 Lakh teachers of Higher education.

He is also the Nodal Coordinator in the country for the Prime Minister Research Fellowship Programme for Computer Science and Mathematics and the Nodal Coordinator for PM SHRI for the implementation of NEP in the Punjab region. He is the founding faculty of the IIT Madras BS Programme. He has graduated 10 PhD students and is currently guiding 5 in the area of Education Technologies.

His research spans AI for Social Good and Education Design. A homeschooling father of two, Dr. Sudarshan finds joy in exploring literature—from short stories to philosophy—fueling his mission to make education inspiring and accessible to all.

Prof. (Dr.) Maya Ingle
Ex-Director, DDU-KK, Indore

Dr. Maya Ingle is a distinguished academician and researcher with a Ph.D. in Computer Science, M. Tech. from IIT Kharagpur and a rich academic background including postgraduate qualifications in Statistics and Music. With 40 years of technical and administrative experience, she has served as a Senior Faculty at SCSIT, DAVV, Indore and held key roles such as Director, DDU-Kaushal Kendra and Dean of Student Welfare at DAVV. Dr. Ingle has guided 21 Ph.D. scholars and has extensive publications in reputed journals. Her research interests include Usability Engineering, Agile Computing and Statistical NLP.

She an assessor for accreditation bodies like NAAC and NBA. Dr. Ingle has received numerous accolades, including the Lifelong Scientific Achievement Award (2022) and Pratibha Samman (2024). Passionate about community service, she supports initiatives for visually challenged students and education for underprivileged children. A recognized expert in her field, she frequently serves as a keynote speaker, reviewer and evaluator at national and international levels.

Distinguished Speakers

Dr. M. N. Hoda is Director of Bharati Vidyapeeth Institute of Computer Applications and Management (BVICAM), New Delhi, India, a position he has held since April 2002. Under his leadership, BVICAM runs two-year MCA and three-year BA (Journalism & Mass Communication) programmes affiliated with Guru Gobind Singh Indraprastha University (GGSIPU), New Delhi. He currently serves as Chairperson of the IEEE Delhi Section (January 2025–Present), actively contributing to professional and academic development in the region.

Dr. Hoda is the Founder Editor-in-Chief of the International Journal of Information Technology, published by Springer, Singapore and indexed in SCOPUS, a role he has served with distinction from January 2009 to June 2025. His academic background includes B.Sc. (Hons.) in Mathematics, MCA and Ph.D. in Computer Science and Applications from Aligarh Muslim University (AMU), Aligarh. He is widely recognized for his contributions to computer science education, research and academic leadership.

Prof. (Dr.) M. N. Hoda
Director
BVICAM, New Delhi, India

Prof. (Dr.) Jemal Abawajy
Professor
Faculty of Science, Engineering and Built Environment
Deakin University, Geelong, Australia

Prof. (Dr.) Jemal Abawajy is Professor in the Faculty of Science, Engineering and Built Environment at Deakin University, Australia. Known for his extensive research contributions in Cloud Computing, Network and System Security, Internet of Things (IoT), Edge/Fog Computing, Big Data Analytics and Decision Support systems. With a prolific record of publications in esteemed journals and conference proceedings, Prof. Abawajy's work has significantly advanced the fields of secure and distributed computing. He actively supervises graduate research, serves in editorial and leadership roles in international scientific communities and is a Senior Member of IEEE, reflecting his global influence and commitment to academic excellence.

Distinguished Speakers

Dr. Duc-Tan Tran is a Professor and Dean of the Faculty of Electrical and Electronic Engineering at Phenikaa University, Vietnam. Previously, he held the position of Associate Professor and served as Vice Dean of the Faculty of Electronics and Telecommunication at VNU University of Engineering and Technology from August 2016 to May 2019. His academic contributions include over 150 publications in leading international journals and conference proceedings. Dr. Tran has received prestigious accolades such as Best Paper Awards in International conferences. He was honored as an excellent young researcher by Vietnam National University, Hanoi and received the third prize in the Vietnamese Talents contest. His research focuses on the representation, processing, analysis and communication of information within signals and datasets. Dr. Tran is also an active participant in the international academic community, serving as a Technical Program Co-chair, committee member, track/session chair and reviewer for numerous conferences and journals.

Prof. (Dr.) Duc-Tan Tran
Dean
Faculty of Electrical and Electronic Engineering
Phenikaa School of Engineering
Phenikaa University, Vietnam

AI-Powered Wearables for Healthcare and Emergency Response

Abstract

Wearable technology is rapidly transforming healthcare and emergency response, offering real time monitoring and intelligent decision-making through accelerometers, IoT connectivity and machine learning. This keynote will explore how these technologies enable novel applications in healthcare—such as activity recognition, gait analysis and early disease detection—as well as firefighter support systems for safety and performance monitoring in hazardous environments. By leveraging advanced sensing, real-time data processing, and AI-driven analytics, we can create adaptive, context-aware solutions that enhance well-being, improve patient outcomes and provide critical support for first responders. The talk will highlight key challenges, opportunities and future directions in developing deployable, high-impact wearable systems that bridge the gap between research and real-world implementation.

Distinguished Speakers

Prof. (Dr.) P. C. Deshmukh
RV Chair Professor
RV University Bengaluru
and
Convenor & Mentor, CAMOST
IIT Tirupati, India

Dr. P. C. Deshmukh is 'RV Chair Professor' at the School of Computer Science and Engineering, RV University, Bengaluru. He is concurrently Convenor and Mentor of the Center for Atomic, Molecular and Optical Sciences and Technologies (CAMOST), which is a joint initiative of the IIT Tirupati and the IISER Tirupati. His recent book Quantum Mechanics – Formulation, Methodologies and Applications is just as well received as his previous book Foundations of Classical Mechanics was. Both these books are published by the Cambridge University Press. About two hundred of his video-lectures, covering four full-fledged courses, are available on the internet. These have been published by the NPTEL and SWAYAM PRABHA.

Quantum Approximate Optimization Algorithms for Intelligent City Planning

Abstract

Intelligent urban development requires smart planning of traffic management, energy distribution, waste management, intelligent parking, efficient rapid response for law enforcement, medical and accident emergencies, etc. Optimization algorithms that employ quantum entanglement provide an intrinsic advantage in parallelism in exploring alternatives. Applications of quantum computing in city planning is farfetched yet, but the methodologies are insightful in developing strategies for smart and green city planning. Logic efficiency is achieved by taking advantage of how nature deals with alternatives. Unlike common intuition which uses binary if-then-else logic, nature admits consideration of probabilistic superposition of mutually exclusive binaries and requires information processing in which realistic statistical predictions are made using a well-tested mathematical discipline. In this talk, I will illustrate how quantum computing provides unparalleled benefits, well beyond the fastest of classical workflows, in analysing alternative pathways.

Distinguished Speakers

Dr. Brij B. Gupta is a Distinguished Professor in the Department of Computer Science and Information Engineering at Asia University, Taiwan and Director of the International Center for AI and Cyber Security Research and Innovations. He earned his Ph.D. from the Indian Institute of Technology Roorkee and is globally recognized as a Clarivate Highly Cited Researcher and among Stanford University's Top 2% Scientists Worldwide. Dr. Gupta has authored over 600 research articles, 35 books and holds multiple patents, with extensive contributions in Cyber Security, Artificial Intelligence, Blockchain, Intrusion Detection, Cloud and IoT security and Cyber-Physical Systems. His leadership roles include serving as an IEEE Distinguished Lecturer, Senior Member of IEEE and Member-at-Large on the Board of Governors of the IEEE Consumer Technology Society, reflecting his broad impact on research, education and international scientific collaboration

Prof. (Dr.) Brij B. Gupta
Director
CCRI, Asia University, Taiwan

Prof. (Dr.) Sandeep Shukla
Director
IIIT, Hyderabad, India

Dr. Sandeep Shukla is a distinguished computer scientist and currently serves as the Director of the International Institute of Information Technology, Hyderabad (IIIT-Hyderabad). He is internationally recognized for his seminal contributions to Cyber Security, Cyber-Physical Systems, Embedded Systems, Blockchain and Dependable Computing. A Ph.D. in Computer Science from the State University of New York at Albany, Dr. Shukla has held eminent academic and leadership positions at IIT Kanpur, Virginia Tech (USA) and Intel Corporation, bridging academia, industry and national mission-mode research. He is an IEEE Fellow, ACM Distinguished Scientist and Ramanujan Fellow and has played key advisory roles for premier national institutions including SEBI, RBI-REBIT, NPCI, CDAC, Ministry of Power and IFSCA. His work has significantly Influenced Cyber Security Policy, Critical Infrastructure protection and advanced computing research in India and globally

Distinguished Speakers

Dr. Urvashi Rahul Saxena is a seasoned Academic Professional with over 20 years of teaching experience. She is currently working as a University Professor in School of IT and Engineering (SITE), Melbourne Institute of Technology (MIT), Melbourne, Australia. Prior to this, she worked as an Associate Professor at JSS University, Noida, India and Manav Rachna International Institute of Research and Studies, Faridabad, India. She completed her PhD in CSE from Jaypee Institute of Information Technology, Noida, India and her M. Tech in Computer Science from Birla Institute of Technology, Mesra, Ranchi, India and her B.E in Information Technology from Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal. Her research areas include Cloud Computing, Restricted Access Control, Trust Computation, Distributed Computing and Networking.

Prof. (Dr.) Urvashi Rahul Saxena
Senior Data Scientist, Professor
MIT, Melbourne, Australia

Significance of Cloud Security Using Trust Oriented Role-Based Access Control (T-RBAC)

Abstract

Cloud computing has become the backbone of modern digital infrastructure, enabling ubiquitous, on-demand access to shared computational resources. However, the rapid adoption of cloud services by enterprises and consumers has significantly amplified concerns around data security, privacy and trust. Among these challenges, restricted access control remains a critical mechanism for safeguarding sensitive and confidential information in cloud environments. Conventional cloud architectures largely rely on centralized access control models, which introduce inherent vulnerabilities. Such centralized systems increase the risk of insider threats, single points of failure and unauthorized data exposure by malicious actors or compromised administrative entities. These limitations necessitate a paradigm shift toward more resilient and transparent security frameworks. This keynote presents a trust-aware and decentralized security model for cloud service transactions, integrating dynamic trust computation to continuously monitor, evaluate and mitigate malicious service nodes. By embedding decentralized trust values into access control decisions, the proposed approach enhances accountability and reduces reliance on centralized authorities. Furthermore, the model leverages Zero-Knowledge Proofs (ZKPs) for Key Management Service (KMS) validation, enabling secure authentication and authorization without revealing sensitive credentials. Through the convergence of restricted access control, decentralized trust mechanisms and zero-knowledge cryptography, this work demonstrates how trust-aware cloud service transactions can significantly outperform traditional access control models. The keynote highlights how this integrated approach improves service transaction accuracy, strengthens data confidentiality and establishes a robust foundation for next-generation secure cloud ecosystems.

Distinguished Speakers

Prof. (Dr.) Akash Saxena
Professor
School of Engineering & Technology
Central University of Haryana
Mahendragarh, India

Dr. Akash Saxena is a Professor at the School of Engineering and Technology, Central University of Haryana and is ranked among the Top 2% Scientists worldwide in Artificial Intelligence by Stanford University and Elsevier. He holds a Ph.D. from Malaviya National Institute of Technology (MNIT), Jaipur, with specialization in Artificial Intelligence, optimization and power system stability.

With over 20 years of academic, research and administrative experience, Dr. Saxena has held key leadership roles including Head of Department, Dean (Research), Controller of Examination and Director (Training & Placement) across reputed institutions. He has played a pivotal role in NBA and NAAC accreditations, curriculum design and outcome-based education implementation.

Dr. Saxena's research focuses on soft computing, computational intelligence and optimization techniques. He has published over 100 research papers in reputed journals, authored book chapters, holds three patents and has supervised multiple Ph.D. and postgraduate theses. A Senior Member of IEEE, Fellow of IETE and Certified NITTTR Mentor, he has also organized numerous international conferences and delivered 50+ expert lectures at national and international platforms.

Dr. Jimson Mathew is a Professor in the Department of Computer Science and Engineering at the Indian Institute of Technology Patna, Bihar, India. He received his Master's degree in Computer Engineering from Nanyang Technological University (NTU), Singapore and his Ph.D. in Computer Engineering from the University of Bristol, U.K.

He has held academic and research positions at several prestigious international institutions, including the Centre for Wireless Communications, National University of Singapore, Bell Laboratories Research (Lucent Technologies), Australia, the Royal Institute of Technology (KTH), Stockholm and the Department of Computer Science, University of Bristol, U.K. He also served as Head of the Department of Computer Science and Engineering at IIT Patna.

Prof. (Dr.) Jimson Mathew
Professor
Computer Science and Engineering
IIT Patna, India

Prof. Mathew has made significant contributions to computer engineering, with research interests spanning hardware security, fault-tolerant computing, VLSI design and design automation. He holds multiple patents, has co-authored three books and has published over 100 research papers in leading international journals and conferences. He is a member of the Institution of Engineering and Technology (IET) and his work continues to have a lasting impact on research and innovation in hardware security and computing systems.

Distinguished Speakers

Manish Gehlot is an alumnus of IIT Bombay and holds an MBA from the University of St. Thomas, Minnesota. He currently serves as the Chief Strategist at Medius Earth, a socio-climate startup dedicated to large-scale forestation initiatives. Alongside this, he leads Oracle Supply Chain Management Consulting for Infosys Consulting in North America.

Mr. Manish Gehlot
Oracle CRL Practice Lead
Infosys Consulting, USA

With a distinguished professional career, He has held senior leadership roles at global organizations including Oracle USA, IBM, Accenture and CP Wholesales. Over the past 14 years, he has been actively engaged in water conservation efforts, with a strong focus on rainwater harvesting and sustainable water storage solutions.more sustainable lifestyles.

Driven by a passion for social impact, he is committed to empowering youth globally to realize their potential as responsible citizens. He supports two family-led social enterprises: Asmakam Life University, contributing to life skills education focused on sustainability, wellness and awareness of global warming and Cotfoo, which strengthens human connections through food by linking families with natural farmers, promoting healthier lifestyles and environmentally responsible practices.

Ms. Archana Parsai Gehlot
Ex-Product Strategy Director
Oracle, USA
Founder, Asmakam Life University
Indore

Archana Parsai Gehlot is an alumna of IIT Bombay and a former Product Strategy Director at Oracle USA, with over 20 years of executive experience in global IT organizations. After a successful corporate career, she transitioned to a sustainable, creative lifestyle, reshaping her approach to health, education, food and agriculture, guided by a philosophy of zero outsourcing.

She is the co-founder of two social initiatives. Asmakam Life University, for the past nine years, has been fostering self-awareness, life skills, sustainability and wellness among parents and children. Cotfoo promotes food as medicine by connecting families directly with natural farmers.

Currently, Asmakam Life University is being developed on a 15-acre permaculture-based farm, reflecting her commitment to regenerative agriculture, conscious living and harmony with nature.

Contents

Abstracts

GovGuideBot: LLM for Government Document Assistance

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Millions of people it is very difficult to apply for important government documents like income certificates, caste certificates, and proof of domicile, especially if they live in rural areas or have limited digital skills in India. Dispersed portals, unclear instructions, inconsistent state-by-state procedures, and district level these all factors complicate the process. These problems often result in process errors, frequent office visits, and the exclusion of less technical expertized individuals. GovGuideBot has been developed, an AI Chatbot, Large Language Model (LLM) that explains government documentation procedures, to address this issue. It provides easy-to-use, location based, step-by-step assistance. In order to understand user intent, the system uses a Named Entity Recognition (NLP) pipeline that is optimized with transformer models like. Named Entity Recognition (NER) is used to identify crucial information such as document type, state, and district. These specifics are arranged in structured JavaScript Object Notation (JSON) workflows that enable region specific instructions. GovGuideBot also uses location entered by user query to adapt procedures for user locations, links to official government websites to guarantee accuracy, and uses the YouTube Data Application programming interface (API) to offer visual tutorials which are particularly useful for users who might have literacy issues or are using these services for the first time. With a precision of 91%, a recall of 93%, and an overall F1-score of 92% for identifying intents and entities, GovGuideBot performs well when tested on actual citizen questions. About half of the planned features were successfully implemented in the working prototype we created for Maharashtra, which includes work-flows for income, caste, and domicile certificates.

Keywords: AI Chatbot, Named Entity Recognition, JavaScript Object Notation, Large Language Model, Application Programming Interface.

A Computational Approach for Identification of Salivary Biomarkers

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A transparent, readily accessible bodily fluid, saliva is essential for maintaining oral health. Numerous biological substances that are useful for illness detection are also present. Saliva has drawn interest recently as a non- invasive, reasonably priced method of diagnosing a range of illnesses. The kinds of chemicals found in saliva that can function as biomarkers are described in this overview, including proteins, DNA, RNA, and metabolites. Diabetes, heart disease, and oral cancer can all be detected and tracked with the use of these biomarkers. Saliva collection is easy, safe, and painless, which makes it perfect for routine medical examinations. The difficulties in using saliva for diagnosis are also covered in this research, including sample storage and guaranteeing reliable results. In spite of these obstacles, continuous. Saliva- based testing is getting better because to continued research, despite these obstacles. Saliva biomarkers have the potential to be a standard component of medical diagnostics in the future, particularly for early illness identification.

Keywords: Saliva, Biomarkers, Non-Invasive Diagnosis, Salivary Diagnostics, Oral Health, Disease Detection, Point-of-Care Testing.

Blockchain in ESG and Green Finance: Enhancing Transparency in Sustainable Investments

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The increasing global emphasis on sustainable finance has placed transparency, accountability, and trust at the forefront of investment practices. However, traditional systems of environmental, social, and governance (ESG) reporting often suffer from data manipulation, fragmented disclosures, and inconsistent regulatory frameworks. Blockchain technology, with its decentralized, immutable, and transparent ledger system, offers transformative potential to overcome these challenges by enhancing traceability, ensuring real-time verification, and reducing the risks of greenwashing in sustainable finance. This paper explores the role of blockchain in advancing ESG compliance and green finance initiatives, with a particular focus on India's growing sustainable investment landscape. Through a review of existing literature, policy frameworks, and global case studies, the study highlights blockchain's applications in carbon credit trading, green bonds, and supply chain sustainability. The paper further analyzes the opportunities and limitations of blockchain integration in financial systems, discussing regulatory, technical, and adoption challenges. Findings suggest that blockchain-enabled solutions can significantly improve investor confidence, streamline ESG audits, and foster alignment with global sustainability goals such as the Paris Agreement and the United Nations Sustainable Development Goals (SDGs). The study concludes that blockchain-driven green finance has the potential to redefine financial accountability and accelerate the global transition toward a low-carbon economy, provided that regulatory support and cross-sector collaboration are strengthened.

Keywords: Blockchain, ESG, Green Finance, Carbon Credits, Transparency, Governance.

A Normalization Technique for Projection Through Mathematical Kcraft

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"Kcraft (craft) Mathematics" is a developed aspect of the personal skills in, geometry, numeracy, trigonometry, and algebra within the creative domain of 3D geometric art. Kcraft Mathematics is the introduction of its own algebraic notation system for mathematical projection, formalizing geometric transformations through symbolic expressions unique to Kcraft's operational principles. This system establishes a new algebraic language that bridges creative geometry and mathematical precision, enabling structured construction and representation of 3D art through mathematical formulation. This is the process of understanding the operation of Kcraft through mathematics. In this article, we are proposing three formulas that facilitate coordinate transformation for projection (specific notation)—allowing specific geometric structures to normalize the coordinate for the projection purpose and formalize the coordinates using algebraic notations. This approach provides a foundational mathematical framework for performing and interpreting Kcraft as both an artistic and mathematical discipline.

Keywords: Craft, 3D Geometric Art, Mathematics, Normalization, Formula, Variables.

Identifying MCCF Vulnerabilities and Preparing Datasets for Effective Analysis: A Comprehensive Approach

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Recommender system has added an incredible convenience by delivering suggestions that are of our interest while we dive into the ocean of information. Among different recommender techniques, Multi-criteria recommender system is the one who determines user preferences by carefully considering the user rating on multiple criteria of an item. As the system is dependent on explicit ratings given by user, this openness may make the entire system vulnerable for shilling attacks, thereby causing malicious users to corrupt the credibility of system by proving fake ratings. Identification of all such vulnerabilities within Multi-criteria Collaborative Filtering provides worthwhile insight for the security and robustness of this recommender system. This study aims to identify various vulnerabilities of Multi-criteria Collaborative Filtering and construction of multiple datasets for specific analytic requirements. The finding underpins measures that are to be taken for building a robust system and the datasets constructed can be used to analyze and study shilling attacks on Multi-criteria Collaborative Filtering more precisely in future researches.
Keywords: Recommender System, Multi-Criteria Collaborative Filtering, Vulnerabilities, Shilling Attacks.

Next Gen Data Centre Modernization Using AI - Based Predictive Maintenance

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The transformation of the data centre is progressively controlled by the predictive maintenance methods of Artificial Intelligence (AI) that ensure sustainability, efficiency, and reliability. Old-fashioned reactive and schedule-based maintenance plans cannot be applied in the complex infrastructures and produce unneeded costs in operation, downtime of the system, and environmental pressure. This paper examines the ability of AI and Machine Learning (ML) technologies to transform the process of data centres management with precision in fault prediction, real-time optimization, and self-healing systems. The sensor networks are up-to-date and monitor temperature, voltage, vibration, and energy consumption, which is analysed in real-time to be smart. AI programs such as neural networks, decision trees, and support vectors work on the data to forecast hardware failure and undertake proactive maintenance measures in the form of component replacement, performance optimization and automated software patches. The research has the descriptive-analytical methodology and summarizes the findings of the studies carried out between 2020 and 2025. It has been found that AI predictive maintenance will lower hardware failures by 30-50 percent, conserve up to 40 percent of energy, and increase equipment life. In addition, it increases green sustainability through reduction of green power and e-waste. According to the research, the outcome of human capacity coupled with AI intelligence is powerful, energy-efficient, and green data centres.
Keywords: Artificial Intelligence, Predictive Maintenance, Data Centre Management, Machine Learning, Energy Efficiency, Sustainability, Fault Detection, Green Computing.

Mobile-Based Smart Advisory System for Mango Disease Alerts After Harvest

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The mango industry suffers heavily from post-harvest losses, especially in tropical agricultural economies. Approximately one-third of the total amount of mangoes that are produced will be lost through the many post-harvest losses associated with fungi that infect the mango crops, as well as other crop types such as grains and seeds. Small and medium-sized producers of mangoes are exposed to many of these pathogens, and many of the efforts put forth by the producers can be completely wiped away if an appropriate preventative action is not taken. Through the use of modern grain and seed production methods, along with new advances in warehouse design, producers of grain and seed do not have any quick and effective means for diagnosing the crop diseases that they experience; therefore, they lose revenue and waste resources. Recently, it has become possible to apply image processing techniques based upon Convolutional Neural Networks (CNNs) to learn to distinguish between the various types of mango fruits based upon the visible symptoms of fungal infection on a mango fruit (for example, Aspergillus niger, stem-end rot and anthracnose). The highest level of accuracy (91%) for a classification system was achieved through the CNN, and the CNN has proven itself to be the most effective in accurately identifying disease.

Keywords: Agricultural Economies, Convolutional Neural Networks (CNN), Raspberry Pi, Aspergillus Niger, IoT, Diseases.

Automated Cattle Identification and Real-Time Monitoring Using Advanced Computer Vision and Deep Learning

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Accurate identification and real-time monitoring of cattle are essential for improving livestock productivity, traceability, and animal welfare. Traditional identification methods such as ear tagging and RFID are intrusive and susceptible to loss or damage.Recent advances in deep learning and computer vision pro- vide non-invasive alternatives capable of continuous and automated monitoring. This paper presents a unified smart livestock monitoring framework integrating visual biometrics, object detection, multi-object tracking, and IoT-based sens- ing. The proposed system employs YOLOv8 for real-time detection, DeepSORT for persistent identity tracking, and convolutional neural networks for biometric recognition and health analysis. A hybrid cloud–edge architecture is designed to enable low-latency inference and scalable analytics. Experimental evaluations on public cattle datasets demonstrate reliable detection, identification, and behav- ior recognition performance under real farm conditions. The framework provides a scalable and non-invasive solution for intelligent livestock management.

Keywords: Computer Vision, Deep Learning, Livestock Monitoring, Cattle Identification, Smart Agriculture, IoT, Precision Livestock Farming, Animal Welfare.

AI-Powered Cybersecurity for Financial Public Sector: A Microsoft Sentinel and Low-Code Power Automate Framework

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The social sphere of the financial world is becoming increasingly exposed to cyber threats, and therefore defense systems must be developed to work independently and be intelligent and capable of expanding automatically.This research paper considers how the artificial intelligence-powered runs of Microsoft Sentinel SIEM scopes can be combined with low-code automation and recent technology in Power Automate to improve cyber resilience. It was a qualitative test on around 50,000 actual and simulated security violations within the financial industry that focused on phishing, privilege escalation, abnormal logins, and fraudulent access. Some of the most important measures of performance included Mean Time to Detect (MTTD), Mean Time to Respond (MTTR), accuracy of detection, false positive rate (FPR) and false negative rate (FNR). The results were pretty impressive: MTTD, MTTR and accuracy were improved 64 percent, 69 percent and 88.5 percent to 96.2 percent, respectively. This was confirmed through comparisons and benchmarking to Splunk and IBM QRadar, and activities performed to determine that the load and the cost/incident to the analysts was minimized. At least at the 95 percent level, statistical tests revealed that such changes were significant. The article demonstrates how artificial intelligence could be used to monitor and track cryptocurrencies with the help of automated processes in order to base decisions taken by the financial security operations on statistical information. The findings show that the Sentinel Power Automate system appears as an affordable, viable and scalable solution to guard financial institutions against growing cyber threats, and it meets the requirements of the regulations.

Keywords: Cybersecurity, Microsoft Sentinel, AI, Finance, Low-Code, Public-Sector, Automation.

Deep Learning Based Predictive Crowd Stampede Analysis and Rerouting

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Sudden crowd crushes at festivals, rallies, or sports events turn safe gatherings deadly in seconds when panic ripples through packed spaces. Guards watching fixed cameras can't keep up with the chaos, missing early shoves or squeezes until it's too late. Our setup layers fast people-spotters YOLOv8 + Deformable DETR with motion trackers ByteTrack, feeding flow maps into ConvLSTM/LSTM for speed bursts and a GCN for group pressure reads—fusing both to flag hot zones and reroute via A* paths. Tested on MOT20's jammed street clips, Layer 2 nails 98% motion alerts while Layer 3 hits 85% on crowd vibes, proving it catches trouble early for real fixes. Tackles blocks, group math, and live tweaks head-on.

Keywords: Crowd Stampede Prediction, YOLOv8, DETR, ConvLSTM, GCN, Farneback Optical Flow, Behavioral Modeling, Rerouting.

Performance Evaluation and Optimization of Pre-Trained Deep Learning Models Using a Weighted Ensemble Approach for Lung Cancer Classification

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Lung cancer continues to be one of the major cancer-related death causes globally, and precise early detection is essential for enhancing patient survival. Recent developments have seen deep learning models as viable instruments for medical image analysis that can automatically and accurately classify cancer. This paper reports a comparative experimental investigation of three pre-trained convolutional neural network (CNN) models—VGG16, ResNet50, and DenseNet121—utilizing the publicly accessible LC25000 lung and colon histopathological image dataset. The models were compared in terms of accuracy, precision, recall, and loss measures to determine the best architecture for lung cancer detection. The experimental results prove that VGG16 performed best with a validation accuracy of 99.88% and minimal loss values, making it the best for this purpose. DenseNet121 achieved a validation accuracy of 99.52%, while ResNet50 achieved 97.84%, both with competitive though comparatively lower performance than VGG16. In addition, a weighted ensemble model was also built combining all the three networks with corresponding weights of 0.3 (VGG16), 0.2 (ResNet50), and 0.5 (DenseNet121). The ensemble showed a total accuracy of 96.88%, which, while strong, failed to surpass the highest performing individual model. These findings indicate that even though ensemble techniques can improve robustness, single models—especially VGG16—can yield better performance in histopathological image classification. The results point to the promise of deep learning for accurate lung cancer detection and underscore the need for comparative model analysis and optimized ensemble approaches to promoting computer-aided diagnostic technology in medical practice.
Keywords: Lung Cancer Detection, VGG16, ResNet50, DensNet121, Ensemble Learning.

Adversarial Training Using FGSM Attack for Convolutional Neural Networks

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Deep neural networks are highly vulnerable to adversarial perturbations, which can significantly reduce their classification performance. To address this vulnerability, this work applies FGSM-based adversarial training to improve the robustness of convolutional neural networks. FGSM generates perturbed inputs through a single gradient-based step, making it an efficient method for exposing model weaknesses. FGSM generates adversarial perturbation examples by applying a one-step perturbation in the direction of the gradient sign, it is fast and efficient attack generation method. Although simple, FGSM is capable of dealing critical weaknesses in convolutional neural networks (CNNs), making it a practical for evaluating model robustness. In this study, FGSM-crafted samples are incorporated during training, and the effect of varying epsilon values and clean–adversarial data ratios is examined on MNIST and CIFAR-10 datasets. Experimental results show that adversarial training enhances resilience against FGSM attacks while maintaining acceptable accuracy on clean inputs.
Keywords: Adversarial Training, FGSM, CNN, Machine Learning Security.

A Multiscale GAN- SOD YOLOV7 Framework for Robust Small Object Detection in Complex Underwater Environment

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The detection of underwater objects is very important in such areas as the marine search, underwater surveillance and environmental monitoring. But it is a difficult task because underwater domain is complex. Where traditional object detection methods can fall short in these cases, due to problems such as differing illumination conditions, low contrast, turbidity and light scattering, obfuscation/occlusion or biological camouflage of marine life with respect to their background. These difficulties contribute to the degradation of performance of traditional algorithms. Against this background, in this paper we propose an advanced underwater object detection framework that combines a Multiscale GAN with the SOD- YOLOv7 detector. The proposed model is comprised of several main components: Adapto Denoise Block, CNN-based Dual Attention Selective (DAS) Network, synthetic data augmentation and Multi-scale Unpaired GAN. The DAS network enhances feature extraction via spatial and channel attention mechanism. In this case, we use the multi scale GAN to generate super-resolved images which are more closer to those generated under real-world settings. We evaluate the proposed method on the publicly available UTDAC2020 dataset which includes a total 6164 images that have different resolutions, including (3840×2160), (1920×1080), (720×405), (704×576) and (586×480). The results show significant improvement over the classical methods, with a mAP = 97.40%, precision = 97.18% and recall = 94.85 %. The model works at fast 115 FPS detection speed and about 105.4 GFLOPs computational complexity. In summary, the SOD-YOLOv7 model put forward in this paper offers a competitive way to detect small object in complex underwater.
Keywords: DAS, Data Augmentation, YOLOv7, Multiscale GAN, Underwater Object Detection.

Implementation and Evaluation of Enhanced CNN Algorithm for Fake News Detection

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In this digital era transformation of digitalization creating unprecedented access to news and content globally. However, advancement of technological some time facilitated and propagate of misinformation across online platforms and social media platforms. Such type of Misleading content can considerably collision economic constancy, political discourse, and social harmony, emphasize the imperative require for forceful systems competent of individual among factual and fabricated information. This paper implements the state-of- art machine learning techniques, and natural language processing (NLP) and identify distinctive patterns, textual characteristics, in addition to contextual indicators that distinguish among authentic and fabricated news content. Preprocessing is a critical step that transforms raw text data into a format suitable for machine learning models. improved algorithm implements a comprehensive pre-processing pipeline with multiple stages. This document provides a comprehensive indication of all pre-processing and post-processing techniques implemented in the enhanced CNN-based fake news detection system. The improvements focus on enhancing text quality, feature representation, model architecture, and evaluation methodologies.
Keywords: Text Cleaning, Fake News Detection, Convolutional Neural Network, Deep Learning.

Advances in Anomaly Detection in Healthcare Using Federated Machine Learning

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In the field of healthcare, anomaly detection is essential in identifying the abnormal tendencies of patient records, function and/or medical procedures of a device. Electronic health records (EHRs), wearable sensors, and Internet of Medical Things (IoMT) devices are big and have created certain challenges in ensuring data privacy and regulatory compliance. The traditional centralized systems of learning are limited by the data sharing restriction and the data security issues. The Federated Machine Learning (FML) eliminates all these drawbacks by allowing model training in the presence of distributed sources, yet without a direct exchange of patient data. In this review, FML-based systems of detection of anomalies in healthcare are thoroughly analyzed in terms of their architecture, mechanisms of privacy protection, and use scenarios. The uniqueness of the given work is in the combination of the experience of two spheres federated learning and healthcare anomaly detection, where privacy-sensitive, distributed analytics is seen as a single unit. Moreover, the main issues of heterogeneity of data, the efficiency of communication and security of the model are addressed with the prospects of the future research. The goal is to influence the creation of secure and scalable healthcare solutions that have the ability to identify anomalies in an efficient manner without compromising the privacy of data.

Keywords: Anomaly Detection, Cyber Security, Edge Intelligence, Federated Learning, Internet of Medical Things (IoMT), Healthcare, Privacy Preservation.

Statistical Feature Fusion Driven Enhanced Network Intrusion Detection

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This study presents a feature selection methodology designed to improve the efficacy of Deep Neural Network (DNN)-based intrusion detection systems (IDS). The suggested method uses a statistical fusion strategy that combines variance thresholding and pairwise correlation analysis to find a small but useful set of network traffic features. The method improves model interpretability and performance by concentrating on features that demonstrate significant variability and minimal redundancy. The proposed approach is examined using three established datasets: NSL-KDD, UNSW-NB15, and CIC-IDS2017. Before training the model, one-hot encoding is used to encode categorical features, and standard normalisation is used to make sure that all the features are scaled the same way. The statistical methods create smaller groups of features, which are then used as inputs for a multilayer DNN classifier. Experimental results show that accuracy, precision, recall, F1-score, and false positive rate (FPR) have all improved a lot compared to traditional feature selection methods like Recursive Feature Elimination, Chi-Square, and Random Forest. The suggested method also cuts down on execution time, even when it uses more features in some cases showing that it is more computationally efficient. The results show that the suggested feature selection strategy could greatly improve the performance and reliability of IDS in different network environments.

Keywords: Intrusion Detection, Statistical Fusion, Feature Selection, Deep Learning.

AI-Driven COVID-19 Detection and Diagnosis Using Multimodal Medical Imaging and Deep Learning Models

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The paper proposes an AI-based scheme of early COVID-19 diagnosis and detection based on multimodal medical imaging, featuring chest X-rays (CXR) and computed tomography (CT). The proposed deep learning architecture (Convolutional neural networks + feature encoders that are transformers) is the one that performs an accurate representation of space and context using convolutional neural networks and transformers that encode the features. The multimodal fusion unit matches dissimilar image attributes to enhance the diagnostic quality and strength. The data includes 12,000 CXR and 8,000 CT images, which have been processed by using adaptive normalization and augmentation. The experimental findings show that the proposed hybrid model has 98.7% accuracy, 97.9% sensitivity, and 98.5% specificity that are higher than existing approach. The GRAD-CAM analysis indicates better localization and readability of the lesion. The strategy is effective in reducing inter-modality deviations and reducing the reliability of automated COVID-19 signs, which contributes to effective triage in medical processes.
Keywords: AI-Driven Diagnosis, COVID-19 Detection, Deep Learning, CNN, Grad-CAM Visualization, Healthcare AI.

Intelligent Multimodal Framework for Explainable Plant Disease Diagnosis and Treatment Recommendation

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Plant diseases continue to pose a significant challenge to food security in the world and this has resulted into extensive loss in crop yield and financial instability among agricultural communities. The conventional approaches to the disease diagnosis are based on manual examination by specialists and are thus time-consuming, subjective, and can never be done at large-scale levels. Most of the existing systems, even recent developments that have achieved significant progress in automated plant disease recognition using leaf image as the single-modality visual input, cannot operate with contextual reasoning, interpretability, and adaptable decision-making, although recent progress in deep learning, especially Convolutional Neural Networks (CNNs) and YOLO-based architectures, has substantially increased the accuracy and effectiveness of automated plant disease recognition. In order to overcome these drawbacks, this paper presents an Agentic AI Framework, which combines visual crop image analysis, natural language symptom description, and structured agricultural knowledge to provide explainable and reliable plant disease diagnosis. The model makes use of coordinated autonomous agents that perform the functions of vision perception, language understanding, multimodal fusion, retrieval-augmented reasoning, and treatment planning. The system is capable of predicting the diseases with accuracy and giving evidence-based and practical treatment recommendations by using the authoritative agronomic resources of ICAR and FAO. Evidence-based on experimental validation of the proposed framework on the basis of PlantVillage and PlantDoc databases proves a higher accuracy of the diagnostics, as well as greater trust, making the given framework a comprehensive decision-support system of sustainable and reasonable crop management.
Keywords: Agentic AI, Multimodal Reasoning, Explainable Diagnosis, Precision Agriculture, Knowledge Retrieval.

Design and Implementation of a Machine Learning Based Hindi Music Emotion Classification System

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Music Emotion Recognition plays an essential part in detecting particular emotion classes in songs by analysing their emotional content. In this study, we design and implement a MER system based on machine learning using acoustic feature analysis on the Hindi Music dataset MER500. Two experiments are conducted using different window and hop size configurations, i.e. 2048×1024 and 1024×512, to analyse the effect of temporal segmentation on emotion classification performance. From each configuration, a set of relevant audio features, including MFCCs, spectral descriptors, chroma features, energy, and tempo-related attributes, are extracted. These features are then classified using various machine learning algorithms such as Support Vector Machine, Random Forest, K-Nearest Neighbours. The results from the experiment demonstrate that window–hop size selection significantly influences emotion classification accuracy. Among the tested configurations, a balanced time–frequency resolution provides superior performance and computational efficiency. The proposed system offers an effective and scalable solution for Hindi music emotion recognition and highlights the importance of optimised signal processing parameters for improved classification performance.
Keywords: Music Emotion Recognition, Machine Learning, Audio Features, Music Signal Processing.

Renewable Energy Adoption: A Pathway to Global Sustainability

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The climate crisis has put the world in a very critical situation and this is the main factor that drives the global switch from fossil fuels to renewable energy sources. It is both a necessity for being able to meet the targets set by the Paris Agreement and for complying with the UN's Sustainable Development Goal 7. Our research covers the five major renewable energy sources, solar power, wind energy, hydropower, geothermal energy, and biomass. We analyze how these different types of energy can contribute to the sustainability of the environment, economy, and society. Moreover, we examine the case studies of China, Costa Rica, the United Kingdom, Germany, and Iceland, which provide various ways of getting the job done. For example, China is investing heavily in infrastructure, while Costa Rica is almost fully powered by renewable energy sources. Major benefits of the research include the creation of 16.2 million jobs worldwide, significant drops in greenhouse gases and air pollution, etc. On the other hand, there are still very large issues to be solved concerning grid integration, financing, and policy issues. The author then presents and summarizes some recent public opinion data and concludes that in the end, the global public is in favor of this with over 72% supporting a fast transition to renewable energy. This gigantic global public opinion imposes on the governments the obligation to act without delay.
Keywords: Renewable Energy, Sustainability, Energy Transition, Grid Integration, Energy Policy, Storage, Decarbonization.

Integrating Smart Cities, Intelligent Systems and VLSI Technology for India's Digital Growth

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India's rapid urbanization is on a large scale and its Smart Cities project of a high-tech city concept has been launched at the same time as its VLSI and semiconductor development. The paper discusses the role of VLSI technology in Smart City systems by looking at urbanization trends expected in India, comparing the domestic "Made-in-India" Vikram-3201 microprocessor with global chips, reviewing recent investments in VLSI and fabrication, and analyzing the impact of U.S.-China tensions on Taiwan's chip industry. We take a look at the smart cities of the world that are at the top of the list for their use of VLSI/IoT technologies and show the innovative works of such cities as Singapore and Barcelona. The accomplishments and drawbacks of India's Smart Cities Mission are presented (34% of projects done, but only 18 of 100 cities completed all works planned). The work applies quantitative trend analysis (e.g., urban population growth rates) and visual representations, and aligns government successes with missed targets, delays, and cybersecurity issues. Moreover, the study portrays the job market in India's VLSI sector (e.g., ~12,000 fresh graduates recruited every year, in addition to ~25–30K employment opportunities arising from major new fab projects). Finally, the paper points out difficulties (exorbitant capital costs, supply-chain constraints, lack of skilled personnel) and innovations (AI, digital twins, 6G) that are going to affect future smart cities. The integrated review leverages data from UN/World Bank, industry reports, and scholarly sources to deliver an all-encompassing, data-supported analysis of VLSI technology and Smart City growth in India.

Keywords: VLSI, Smart Cities, Urbanization, Semiconductor Industry, Vikram-3201, IoT, Digital Twins, 6G, Taiwan Chip Dominance, India Semiconductor Mission.

A Guaranteed Contract Farming System for Stable Market Access

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This study proposes launching an Assured Contract Farming System to help farmers to explore the market virtually and making more money and gaining easy access to markets. Consumers and farmers will take advantage of this technology in the creation of a well-structured and binding contracts that are traceable, readable and completed on time. One can pick crops, agree on the contract, log the movement of products, identify farmers and send messages in real time. Additionally, it offers safe storage of documents and digital signatures to ensure that it is legal, and conflicts of any kind are reduced to a minimum. The strategy that is being proposed in the proposed model is scalable and inclusive in contract farming with no middlemen in this process. Technology will take the lead role instead. The testing and feedback from the stakeholders indicate that farmers can now earn in a predictable manner because farmers are now endowed with confidence and there are no uncertainties in markets either.

Keywords: Price Stability, Open Contracts, Farmer-Buyer Agreements, Contract Farming, Agricultural Supply Chain, Digital Farming Platform, Stable Market Access, Rural Empowerment, Market Connectivity, Sustainable Agriculture.

Speech Recognition and AI in Chess: Creating an Application That Uses Voice Commands to Play Chess

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This research leads to the development of a modern chess application of classical chess that utilizes the marvels of modern technologies like speech recognition to make an already popular game more interesting and widely accessible to people that are unable to participate in the game using current inputs. Chess is a game being played for generation, yet it has not died out to the forward march of time because of its structural and logical gameplay. By mixing it with modern marvels of software advancement we revolutionize it in such a way that the inherent traditional game stays with us longer the generation in future unseeable will engage with it too. The proposed application is developed with the support of flutter, python, WebSocket, NLP, speech recognition comes a new era in chess. While also giving a brief insight into the world of ASR models and their comparison. Overall, the study demonstrates that how blending traditional games with modern technologies can preserve their relevance and encourage future generation to engage them with new ways.

Keywords: Speech Recognition, NLP (Natural Language Processing), Voice Recognition, API (Application Programming Interface), WebSocket.

RootSense Multimodal Crop Disease Diagnosis With Soil Weather Fusion and Conversational Recommendations

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RootSense is an artificial intelligence-powered chatbot designed to assist farmers and farming in India by automating crop disease diagnosis and consulting services. Using photographs of crops uploaded by farmers, RootSense utilises hyperlocal environmental variables such as soil qualities, current weather, and location-specific agronomic data to provide context-aware and farm-specific recommendations, in contrast to existing methods of crop diagnosis using only computer vision techniques. In comparison, RootSense will extract data from the hyperlocal environment of each photograph uploaded by the farmer and combine it with the physical properties of the soil (i.e., moisture, pH, and nutrient levels) to create diagnostic suggestions to farmers that are not generalised or misdiagnosed for that specific farm. The architecture for RootSense includes five main components: (1) the requirements analysis for farmers, (2) the collection of multimodal data from the PlantVillage and NBSS and LUP databases, (3) the classification of crop diseases using CNNs, (4) the use of ensemble fusion to infer the most likely cause, and (5) the deployment of the service using the Node.js, React Native, and Cloud APIs platforms. RootSense will provide geographically-based (geo-location) real-time advice on crop management, pest control, and irrigation to help farmers in different agro climatic regions of India. Compared to the current benchmarks of 78-80% for image-only methods of diagnosis, the experimental results indicate that the RootSense service will produce diagnostic results of approximately 95-96%.

Keywords: Multimodal Crop Disease Diagnosis, Ensemble Learning, Soil-Weather Data Fusion, Convolutional Neural Networks.

Renewable Energy: The Path to Global Sustainability and Climate Resilience

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Because of the abrupt climate change and the gradual depletion of oil and gas resources, there is an extreme need for transitioning into green energy is required. In this area, this research paper aims to search for alternative forms of energy like solar energy, wind energy, hydro energy, geothermal energy, and biomass energy. This regards their importance in supporting a sustainable future from an economic, social, and environmentally responsible perspective. Along with it, this research paper will help in attaining Sustainable Development Goal 7 and Sustainable Development Goal 13. Based on the study, there are great advantages in the use of renewable energy sources. These include the reduction of pollution in the environment and the enhancement of energy security. The use of renewable energy faces a variety of challenges like high initial investment, and a lack of adequate access to new technologies.
Keywords: Renewable Energy, Climate Resilience, Sustainability, SDGs, Energy Transition, Decarbonization.

Agentic Multi-Agent AI Framework for Autonomous Smart Home Service Orchestration and Ethical Decision-Making

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Home service management in the modern cities is often characterized by users needing to compare, search manually and book service providers such as plumbers, electricians and so on cleaners. This is not very fast and is normally time consuming effective, and does not utilize automation much even though the progress in artificial intelligence and smart house technologies. This study offers a solution to this problem Smart Home Service Management AI Agentic Framework. The framework is made to manage the entire service lifecycle but automatically, out of knowing what the user wants to service requests scheduling and tracking. The model uses To analyse user requests, Natural Language Processing (NLP) which are frequently in natural language, and obtain important details such. as type of service, date desired and time. These processed details is then an extracted detail which is processed by a multi-agent system which has three specialized agents, a Booking Agent that finds and appoints at hand service providers, a Negotiation Agent which manages the optimization of costs and timeframes and a Monitoring. Confirmation agent that verifies the bookings and makes them real time. updates on the status. It is created on the Python, Flask system and LangChain and it operates on an SQL database effective data control and access. The result is a simulated prototype which enables the user to book home services by simply by the use of natural language commands. This approach shows how autonomous task coordination and agentic reasoning can enhance user experience, reduce manual work, and establish the stage intelligent self-operating smart home.
Keywords: Agentic AI, Smart Home Automation, Multi-Agent System, Natural Language Processing, Service Management, LangChain, Autonomous Booking, AI Agents, Flask Framework, Home Service Platform.

COMBAT: Continuous Monitoring of Browser Extensions Against Post-Installation Threats

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Browser extensions are lightweight software components that increase user productivity and improve the overall web browsing experience. These extensions have special system permissions that can make them a potential target for attackers. Previous studies show that many malicious extensions are safe at installation time but become harmful through version updates. The existing defenses focus on pre-installation analysis but fail at detecting threats after installation of these extensions. Extensions bypass pre-installation verification through techniques like malicious updates, permission escalation and delayed activation attacks. This paper proposes a lightweight monitoring system that operates directly in the browser to track extensions after installation. It performs update delta analysis on code structure and permission sets. It also analyzes network connections and API usage through static signals for assessment of risky behavior. Our approach enhances the existing browser extension security system by providing continuous post-installation protection. The proposed system complements existing store-level and machine learning defenses.
Keywords: Browser Security, Extension Security, Malware Detection, Continuous Monitoring, Update Analysis.

Hybrid Explainable Phishing URL Detection Using Transformer-Based Embeddings

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Phishing has always been a prevalent cybersecurity threat, using human trust and vulnerabilities in the internet to acquire sensitive information. Standard machine learning and deep learning models have improved the accuracy of phishing URL detection. However, they continue to strive to adjust to the growing severe attack patterns and integration with real world security systems and lack explainability. This paper introduces a hybrid framework for detecting phishing URLs that blends transformer based semantic comprehension with rule-based cybersecurity intelligence to improve robustness and Legibility. Our methodology improves the BERT Phish Finder model by applying MiniLM embeddings for optimized semantic representation, along with lexical, structural, and heuristic URL characteristics. A Random Forest classifier, combined with a bespoke Trust Index, rule-engine and Deep Learning Model delivers multi-dimensional scoring to categorise URLs as Safe, Suspicious, or Phishing. Additionally, by visualising the model's decision factors, Explainable AI (XAI) with SHAP improves transparency. Real-time detection capabilities and interpretable outputs are demonstrated by the initial implementation using streamlet. In order to lay the groundwork for cross-domain integration across network monitoring, database systems, and big data security analytics, this research attempts to reduce the gap between pure AI models and useful cybersecurity applications.
Keywords: Phishing URL Detection, Threat Detection Systems, Semantic-Structural Fusion, Hybrid Machine Learning Model, Semantic Feature Representation, Cybersecurity Rule Engine, Trust Index Evaluation, XAI, SHAP.

Artificial Intelligence and Machine Learning Integrated for Innovation: The Future of Business Strategy

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The implementation of the technologies of Artificial Intelligence and Machine Learning is inevitable in the contemporary changing environment of businesses as they promote innovation and influence strategic decision-making. This study encompasses the artificial intelligence and machine learning, their functioning, and their transforming the nature of the business operations. The in-sights based on data will be of paramount importance as Artificial Intelligence and Machine Learning have a potential to transform strategy planning through the analysis of big data, pattern identification, and predictive models' development. Artificial Intelligence and Machine Learning help businesses to get a competitive advantage, simplify their workflows, and become more efficient, generating new ideas based on real-life experiences. Research shows that Artificial Intelligence and Machine Learning may improve supply chain operations and customer service. Businesses cannot encourage an innovative spirit without combining creative thinking with data-driven analysis. Making decisions, creating products, and interacting with customers will all be drastically altered by Artificial Intelligence and Machine Learning. Responsible innovation is more likely to occur when companies think about the ethical and practical issues that come with using AI and ML on a wide scale. For companies to succeed in the dynamic future of business strategy, this chapter offers guidance on how to include AI and ML for innovators, strategists, and company executives.

Keywords: Artificial Intelligence, Machine Learning, Innovation, Business, Strategies, Organizations.

A Review of Monitoring Heart Rate and Cardiac Rhythm by Video Photoplethysmography on Mobile Devices

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Nearly all of us have smartphones at all times, but few of us consider these devices' capability to monitor us passively for health-related reasons. In this review, I will examine in greater detail a technique known as Video Photoplethysmography (VPG) that enables a smartphone camera to estimate heart rate and heart rate variability without requiring users to wear any sensors or follow specific instructions. Here is a summary of a new technique for a completely passive health monitoring function using pulse monitoring through devices based on colors observed through users' faces. In this technique, a heart pattern monitoring system will be applied using data collected from more than a hundred adult participants with and without atrial fibrillation. In addition, despite challenges like users moving around and changes in room illumination, this system can recognize heartbeats in a consistent manner. Of course, challenges remain in this technique, and these challenges include ensuring a device can function regardless of users' skin and may work with various models of smartphones.

Keywords: Video Photoplethysmography (VPG), Mobile Health Monitoring, Contactless Heart Rate Monitoring, Passive Monitoring, Smartphone-Based Sensing, Heart Rhythm Analysis.

Reconceptualizing Training and Development for Sustainability Competency Formation

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The increasing complexity of environmental, social, and economic challenges requires organizations to rethink how sustainability competencies are developed within the workforce. Traditional training and development (T&D) approaches, which primarily focus on short-term performance and technical skills, are insufficient for addressing sustainability-related demands. This conceptual paper reconceptualizes training and development as a strategic and transformative process for sustainability competency formation. Drawing on interdisciplinary literature from human resource development, sustainability studies, and organizational learning, the paper argues that sustainability competencies encompass not only knowledge and skills but also values, systems thinking, ethical reasoning, and change-oriented mindsets. It proposes a shift from episodic, compliance-driven training toward continuous, experiential, and reflective learning embedded in everyday work practices. The paper further emphasizes the role of organizational culture, leadership support, and inclusive learning environments in enabling sustainability-oriented capability building. By integrating training and development with sustainability objectives, the paper contributes to theory and practice by positioning workforce learning as a critical driver of long-term organizational resilience and sustainable value creation.
Keywords: Training and Development, Sustainability Competencies, Organizational Learning, Organizations.

Physiological Signal-Based Real-Time Driver Alert System Using Blood Pressure Sensors

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Driver fatigue is a major cause of road accidents, especially during long drives or late at night. Detecting reduced alertness early can help improve road safety and prevent crashes. This paper presents a realtime driver drowsiness detection and alert system that uses physiological signals from a blood pressure (BP) sensor. The system continually takes systolic and diastolic pressure readings and looks for changes that might indicate fatigue. When it spots unusual patterns, like sudden drops or irregular changes in blood pressure, it produces an immediate audio alert to help regain the driver's focus. The proposed system is created with Python for real-time data collection and decision-making. It is meant to be simple, cost-effective, and doesn't require complicated hardware or large datasets. The results show that using blood pressure signals for monitoring is a practical and effective way to improve driver safety through timely detection and intervention.
Keywords: Drowsiness Detection, Blood Pressure Sensor, Arduino Nano, Real-Time, Road Safety.

Adjoining the Relationship Between Organizational Culture and Employee Engagement in the Software Sector

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This investigation seeks to examine the relationship that exists between the culture of the organization and the degree of engagement displayed by the employees in their line of work in software companies rated in the state of Telangana, and hence ensuring the creation of the culture of perceptions that can be positive in boosting employee engagement. The concept of organizational culture has been considered an efficient way of understanding the human systems. These scholars used both qualitative and quantitative data in their research study as the mixed-method approach. A sample population of software firms located in Hyderabad, a Telangana area, was used to select the respondents using a purposive sampling technique to come up with 150 respondents. Once this was selected, a simple random sampling technique was applied so that it could carry out the study. The data collection was done using technological tools such as the surgeries with the closed-ended question and the semi-structured interviews. The qualitative information was evaluated through theme-analyses, whereas the quantitative information was evaluated with the assistance of the inferential and descriptive statistics. The employee opinions of the two were positive when it came to matters of the organization culture that included aspects like involvement, consistency, adaptability and mission on the other hand, there was the employee engagement where issues like vigour, absorption and dedication were involved.

Keywords: Employee Engagement, Organization Culture, Software Companies, Employees.

Assessing the Role of Green Finance for Sustainability in Shaping the Growth and Competitiveness of India's Insurance Industry

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The effects of climate change are getting worse and spreading faster in many places. The insurance industry is not very connected to any of the sustainability dimensions right now, but that might change quickly. Reports show that India, which is more vulnerable to tropical cyclones and extreme weather, had these kinds of conditions on 314 out of 365 days in 2022 and 2023. In today's world, the insurance business is realizing more how important sustainability is. As environmental, social, and governance (ESG) issues become more important, regulatory organizations have a big say in how the business will develop. The Insurance Regulatory and Development Authority of India (IRDAI) is leading the way in promoting sustainable insurance practices in India. This article looks at the many ways that IRDAI helps the insurance industry become more sustainable, including being environmentally responsible, socially inclusive, and ethically governed. The role of insurers, notably in the property, autos, and casualty categories, in dealing with environmental and climatic risk problems and creating a truly sustainable, environmentally friendly business model is looked at in the background. Green insurance based on the Principles of Sustainable relooks at the produced full roadmap and insurance value chain for executive management to plan their company's sustainability initiatives, with an emphasis on property and casualty insurance and additional information. This research article is a conceptual examination of insurance and insurance goods, during which the regulatory body adheres to the mapped Sustainable Development Goals (SDGs) relevant to existent products.

Keywords: Green Insurance, Sustainability, ESG, Finance, Insurance Sector.

Sustainable Consumption Patterns and Consumer Behaviour: An Empirical Study Aligned with SDG 12

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Sustainable Development Goal 12 (SDG 12) focuses on responsible consumption and production by promoting efficient resource use and waste reduction. The present study examines sustainable consumption behaviour in the Indian context by analysing the interrelationships among consumer awareness, perception, purchase behaviour, and post-purchase satisfaction. The study is based on primary data collected from 321 consumers across different urban regions of India using a structured questionnaire. Descriptive statistics were employed to examine demographic characteristics and response patterns. Chi-square tests were applied to assess the association between demographic variables and sustainable consumption behaviour, while correlation analysis was used to explore relationships among awareness, perception, satisfaction, and recommendation intention. The findings reveal that consumer awareness of sustainable products is moderate to high; however, purchasing behaviour varies significantly across demographic groups. Age and gender show statistically significant associations with awareness and purchase behaviour. The results further indicate a positive relationship between consumer perception and post-purchase satisfaction, which in turn influences the intention to recommend sustainable products. Despite growing awareness, practical factors such as price, availability, and trust in sustainability claims continue to limit consistent adoption. The study contributes empirical evidence from an emerging economy and highlights the need to align sustainability initiatives with real-world consumer constraints.

Keywords: Sustainable Consumption, Consumer Behaviour, SDG 12, Purchase Behaviour, Consumer Satisfaction.

Reversible Computing Foundations in Quantum Computation: From Classical Logic to Quantum Algorithms

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Reversible computing can help give a foundational understanding of quantum computation. First, we consider the classical reversible logic gates, like CNOT and Toffoli, and show how these can be made to simulate arbitrary Boolean functions. Next, we talk about quantum gates and circuits; quantum operations are unitary and reversible in nature. The Deutsch–Jozsa algorithm, phase estimation, and Shor's factoring algorithm are examples of quantum algorithms whose reversibility leads to exponential speed-ups. In the end, a description of present and future challenges in quantum hardware and algorithm design are provided in the paper. The goal of this work is to connect classical reversible logic with quantum algorithms in a coherent manner.

Keywords: Quantum Computation, Reversible Computing, Quantum Algorithms, Shor's Algorithm, Quantum Fourier Transform, Quantum Gates.

Predicting Small-Scale Industry Growth Under Government Credit Programs: A Data-Driven Machine Learning Approach

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This paper will explore how government credit programs affect the development of small-scale industries (SSIs) and build a predictive machine-learning model that helps in predicting the performance of firms. The study utilizes empirical strategy that incorporates causal inference and predictive analytics using data of 300 small-scale firms. Propensity Score Matching (PSM) has been used to address the issue of selection bias matching credit-supported firms with similar non-beneficiaries using observed firm attributes. To estimate the causal effects of government credit in the growth of sales, they estimate the Average Treatment Effect on the Treated (ATT). To supplement the causal analysis, various machine-learn algorithms are trained to forecast firm growth in terms of credit amount, firm age, managerial experience, working capital and other performance indicators, namely; Random Forest, Gradient Boosting, Support Vector Regression, and Multiple Linear Regression. RMSE, MAE and R 2 measures are used to imagine model performance. Results indicate that the positive causality effect of government credit on the growth of firms is significant and that firms supported by credit perform better than matched controls. The results of machine learning indicate that Random Forest has the best predictive accuracy and credit amount and working capital are the most influential features. The research findings are that government credit programs significantly increase the SSI performance and AI-based models are useful in policy targeting.
Keywords: Government Credit Programs, Small-Scale Industries, SME Growth, Credit Allocation, Firm Performance.

Blockchain in Land Lease and Mortgage Management System: Benefits, Trends and Challenges

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The Land Lease and Mortgage Management System (LLMMS) is the crucial part of land administration, since it is essential for investment, resource allocation and economic growth of any developed or developing country. However, LLMMS has problems like fraud vulnerability, inefficiency, and a lack of transparency. By digitizing land records, although efficiency was enhanced however, problems like double-spending, centralized databases, and manipulation were not resolved. Further issues with traditional lease and mortgage administration systems are complexity, mistakes, and a lack of real-time confirmation. Due to frequent, minute-by-minute events like document verification ,land transfers, acquisitions, and leasing/mortgaging transactions, there is currently a large volume of data generated that can be categorized as big data. In this regard, Blockchain-based LLMMS provide distributed data management in addition to addressing the problems of alteration and double-spending in conventional systems. Using knowledge from previous studies, this analysis explores the integration of blockchain with the traditional LLMMS in order to offer a thorough grasp of the opportunities, problems, and potential solutions that can resolve the existing issues.
Keywords: Land Lease, Mortgage, Blockchain, Decentralization.

Fluorinated Groundwater in Madhya Pradesh A Multi-Scale Hydrogeochemical and Health-Risk Assessment with Engineering-Oriented Mitigation Strategies

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Epidemic of fluoride pollution in ground water, poses a serious health as well as the hydrogeochemical problem in MP.This study integrates government monitoring, district hydrochemical surveys and published articles in peer-reviewed journals (2021–2025) to conduct a multi-scale analysis of fluoride geo distribution, geochemical controlling factors, exposure risk and practicable mitigation options. Spatial mapping of integrated datasets also reveals the presence of fairly consistent fluoride hotspots in hard-rock terrain particularly Jhabua, Seoni, Dhar and adjoining districts where alkaline pH, higher bicarbonate : calcium ratio coupled with longer aquifer residence time favour processions of fluoride. Probabilistic exposure estimates with representative concentration ranges show that children in impacted habitations commonly exceed non-carcinogenic risk thresholds, block-level sample sets have very high exceedance fractions (often >60–70%). Simultaneously, the new industrial pollutants (PFAS, Plasticizers) and high TDS in some urban-industrial areas make treatment options selection and residuals disposal more challenging. Assessing options for defluoridation according to available engineering units, the integrated implementation of a decentralized community defluoridation (activated alumina / locally treated mineral media), targeted reverse-osmosis with low-tech brine handling elements and catchment recharge measures provides the most viable pathway for large-scale risk reduction in MP's rural landscape. The paper proposes a road-map to prioritize (1) targeted hotspot testing, (2) community pilots with effective O&M and brine disposal practices, (3) district level dashboards for monitoring, and (4) health surveillance integrated into water supply planning. This review provides useful insights to develop appropriate engineering interventions and policy initiatives for sustainable groundwater safety in the MP state.

Keywords: Fluoride, Groundwater Quality, Hydrogeochemistry, Exposure Assessment, Drinking-Water Risk.

Ovarian Cancer Prediction Using Deep Learning: A Comprehensive Review

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This systematic study investigates the constraints impeding the implementation of Computer-Aided Diagnosis (CAD) systems in medical diagnostics, with a specific emphasis on Ovarian Cancer (OC). Our comprehensive analysis of existing literature revealed that a major limitation is the inadequate scale and variety of datasets, which negatively impacts the precision of predictive models. Prior research suffers from a lack of thorough testing on diverse datasets, leading to restricted applicability and reliability. Furthermore, there is a pressing requirement for progress in image segmentation and accurate identification of tumor size to improve the precision of (OC) categorization and early-stage prognosis. It is crucial to address these gaps to enhance the accuracy of diagnosis and, as a result, improve the survival rates of patients with (OC). This review highlights the need for stronger, more varied datasets and improved analytical methods to enhance computer-aided diagnosis procedures in (OC).

Keywords: CAD, Ovarian Cancer, Deep Learning, Region of Interest, Segmentation.

Technological Advancement in Online Dispute Resolution: Challenges & Limitation

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Online Dispute Resolution (ODR) is an alternate dispute redressal technique to resolve the disputes without meeting a person necessarily. ODR is beyond e-ADR or ADR enabled through technology which can help in avoidance, resolution and containment of dispute because of its features of cost effectiveness, convenience and remote resolution eliminating the physical presence of parties. Multi-tiered online dispute resolution models have been adopted by countries to maximize the benefits of ODR providing for an alternative ODR solution. The ODR systems offer a new method to resolve disputes by reducing costs and eliminating the travel time, ensuring equality in access to justice. A test project was started by eBay in 1999 for online mediation to resolve disputes between buyers and sellers. The rapid growth of the internet and success of eBay ODR platform led to the launch of 115 ODR programs by 2004. India has its own platform like Sama, a Bengaluru-based ODR platform, established in 2015 for integrating mediation and conciliation into India's corporate and legal systems in sectors like matrimonial, e-commerce, insurance, banking, and property. In the era of E-Commerce, ODR Mechanism can be an effective tool for resolving Cross-Border Consumer Disputes but it faces constraints including jurisdictional variability, rapid technological changes, limited data availability, diverse user experiences and language barriers.
Keywords: Online Dispute Resolution (ODR), Online Platforms, Technology, NALSA.

Implementation of Pose Estimation as a Foundational Module for AI-Based Dance-Fitness Assistance Systems

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There is an ever-increasing trend of pursuing newer ways through which physical and mental well-being may be maintained through dance and fitness. Along with the growth of online training and home workouts, there is also an ever-pressing need for systems that are intelligent enough to capture and track human movements in real time. Pose estimation is a computer vision-based technique that infers key body landmarks from video inputs to estimate posture and study motion without the use of wearable sensors. A few of the existing methods are OpenPose, MoveNet, and PoseNet; most of these have a limitation in computational dependence on GPUs, single-person detection, reduced accuracy on rapid movements, and sensitiveness against variation in illumination, thus limiting their usability in dynamic dance and fitness environments. The main aim of this work is to develop a system named the Integrated Real-Time Pose Stability and Analysis IRPSA framework. IRPSA uses MediaPipe BlazePose with OpenCV to perform real-time pose estimation, temporal smoothing, and adaptation to illumination changes on conventional CPUs. This framework calculates joint angles, performs motion stabilization in consecutive frames, and maintains stability under different lighting conditions. The performance evaluation was conducted using the pose landmarks produced by MediaPipe BlazePose, which has been trained on Google's internal large-scale human-pose and athletic-pose datasets, in addition to recorded video samples of dancing and fitness under several lighting conditions.
Keywords: Pose Estimation, MediaPipe, Temporal Smoothing, Lighting Robustness, Joint Angle Analysis, Motion Stability.

Implementing End-to-End Encryption in 6G for Preventing Smishing Attacks

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The transformation of 5G to 6G mobile networks has created a lot of benefits and innovation in the field of communication technology. However, together with its benefits comes the new cybersecurity threats especially on smishing attacks. Smishing, which is a type of phishing attack that utilizes the Short Messaging Service (SMS) platform, takes advantage of its wide usefulness to deceive their victims into disclosing important information. Due to the potential risks that this problem brings, we propose Q-CHAI-6G, an end-to-end quantum-resistant secure encryption system that leverages its security through the utilization of cryptographic algorithms, blockchain key management, and AI-driven threat detection. With the utilization of homomorphic encryption and zero-trust authentication, our framework will effectively assist with the confidentiality, integrity, and availability of data as well as the mitigation of smishing attacks.
Keywords: Encryption, 6G Communication, Smishing, Cyber Security.

A Federated Learning Framework for Privacy Preserving Threat Detection in Zero Trust Network Access (ZTNA)

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Zero Trust Network Access (ZTNA) has emerged as a fundamental cybersecurity strategy by implementing continuous verification and least-privilege access management in dispersed systems. Current ZTNA threat detection methodologies mostly rely on centralized machine learning models, which encounter scaling constraints, heightened latency, and considerable privacy vulnerabilities stemming from the centralized collection of sensitive endpoint in- formation. To address these challenges, this paper proposes a federated learning (FL) enhanced ZTNA frame- work for privacy preserving threat detection. In the proposed system, endpoint devices collaboratively train a shared machine learning model by performing local training on endpoint telemetry and transmitting only privacy-protected model updates to a central aggregator, rather than sharing raw data. A hybrid threat detection model combining Long Short-Term Memory (LSTM) networks, auto encoders, and Random Forest classifiers is employed to capture temporal behavior, anomaly patterns, and contextual threat characteristics. Experimental evaluations conducted on public benchmark datasets and large-scale enterprise telemetry demonstrate that the proposed FL-based approach achieves detection accuracy comparable to centralized models (within 1.5–3.0%), while reducing measured privacy leakage by approximately 35–40% and maintaining acceptable communication overhead. These results indicate that federated learning provides a scalable and privacy-aligned solution for real-time threat detection in ZTNA environments, enabling enhanced security without compromising data locality or regula- tory compliance.
Keywords: Zero Trust Network Access, Federated Learning, Machine Learning, Distributed Endpoints.

Image Steganography: Password Security Method

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Steganography is a powerful technique for embedding hidden information within digital media. This paper focuses on a web-based tool for encoding and decoding hidden text within images using steganography. The primary objective is to provide an intuitive platform for secure communication by concealing sensitive information in the alpha channel of image pixels, ensuring that the modifications are imperceptible to the human eye. The encoding process begins by encrypting the input text with a user-provided password using the AES encryption algorithm. The encrypted text is then embedded into the alpha channel of the image's pixel data, with the length of the text stored in a specific pixel for retrieval during decoding. On the decoding side, the tool extracts the encrypted data from the image, decrypts it with the provided password, and displays the original text. To enhance usability and transparency, the system features a visualization mode that highlights the modified pixels, offering insight into the steganographic process.The paper is implemented using HTML5, JavaScript, and the CryptoJS library for encryption. It features a user-friendly interface for selecting images, entering text, and providing encryption passwords. Additionally, the tool ensures data security by combining encryption with steganography, making it suitable for applications requiring confidential communication or watermarking. This paper demonstrates the integration of cryptographic principles and steganographic techniques, providing a simple yet robust solution for secure data embedding.

Keywords: Steganography, Image Steganography, AES Encryption, Alpha Channel Encoding, Secure Communication.

Brain Tumor Classification Using Transfer Learning on Preprocessed MRI Images

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Accurate and early detection of brain tumors is important because it directly influences treatment planning and overall patient outcomes. In this work, an improved brain tumor detection method is presented, combining U-Net—a widely used deep-learning architecture for medical image segmentation—with basic morphological operations to produce more dependable results. Early and correct identification of tumor regions is still essential for clinical decisions and patient management. In the current setup, U-Net performs pixel-level segmentation on preprocessed MRI scans, and its initial output is refined through morphological steps that help sharpen boundaries and increase accuracy. This combination has already shown promising segmentation performance. Building on this, the proposed model further strengthens the U-Net structure by integrating transfer learning through pretrained CNN encoders. Along with this, more advanced preprocessing techniques and adaptive post-segmentation adjustments are planned to enhance the reliability of the results. With these additions, the upgraded U-Net is expected to produce more accurate pixel-level segmentation and support a more effective diagnostic pipeline. The system will be tested on MRI datasets collected from different scanners and patient groups to ensure strong performance in both tumor segmentation and classification tasks.

Keywords: Brain Tumor Detection, MRI, U-Net, Deep Learning, Image Segmentation, Morphological Operation, Transfer Learning, CNN Encoders, Preprocessing, Post-Segmentation.

ASTITAVA: An AI-Powered FRA Atlas and Decision Support System for Tribal Land Justice

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Astitava is a single, AI-driven system that combines a Forest Rights Act (FRA) atlas with a decision support tool, aimed at solving long-term problems in how FRA is implemented across India. Even though the FRA has been in place for more than ten years, its execution still faces many issues like low recognition of individual and community forest rights, scattered data systems, manual handling of claims, and limited use of geospatial tools to verify locations. Astitava uses satellite data from Sentinel-2 to detect changes over time through NDVI time series, collects field data even without internet, uses OCR and NLP to understand forms in multiple languages, and includes a decision-making engine that follows government rules for eligibility. It brings together environmental data with information about social and economic challenges to prioritize FRA claims algorithmically and automatically link them with national programs like PM-JANMAN and other livelihood support initiatives. The system is built on open geospatial technology and follows IndEA 2.0 and data sovereignty standards, making it more transparent, reducing the room for administrative bias, and speeding up the recognition of rights for Scheduled Tribes and Other Traditional Forest Dwellers. The platform offers a scalable, policy-compliant digital solution for improving tribal land rights and supporting better-informed governance.

Keywords: FRA Implementation, Geospatial Analytics, Decision Support, Satellite Monitoring, Digital Governance.

GUARDIAN GAZE: AI for Crowd Safety Real-Time Monitoring and Alert System

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Simhastha draws massive crowds, making safety and movement management critical. This project uses AI and computer vision, to monitor crowd density in real time and support authorities with timely alerts and guidance. By visualizing overcrowded zones and suggesting safe redistribution, it helps prevent accidents and ensures smoother crowd flow. This system ensures safety, order, and smart management during mass gatherings. Future enhancements include predictive analytics, AI-based anomaly detection, and drone integration for aerial monitoring. Overall, it empowers authorities to make faster, informed decisions. The system also reduces manual monitoring efforts and improves emergency response efficiency. By leveraging real-time data and intelligent insights, it helps prevent crowd related disasters and supports sustainable event management.

Keywords: Crowd Monitoring, Computer Vision, AI Surveillance, Real-Time Alerts, Event Safety.

Student Gatepass Management System

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The College Management Application is a comprehensive platform that streamlines and automates key operations in educational institutions, improving efficiency, accountability, and communication. It provides role- based access for Admins, Teachers, Students, Parents, Security, and Transport staff, with permissions tailored to each role. Admins oversee user management, system settings, and reporting, while teachers manage attendance and student performance. Students and parents can access attendance records, Gate Pass requests, and profiles, and security staff ensure campus safety. A robust database stores user credentials, attendance, Gate Pass history, and schedules, enabling real-time updates and detailed reporting. The structured early Gate Pass workflow involves student requests, parent confirmation, approvals from class teachers and Heads of Department (HOD), and final validation by security personnel to ensure compliance and safety. The system also supports profile management for updating information, a communication module for messaging and announcements, and automated email notifications for updates like account creation, attendance, and Gate Pass statuses. By integrating these features, the application modernizes institutional operations, enhances transparency, and supports data-driven decision- making, making it an essential tool for improving the educational experience.

Keywords: College Management System, Role-Based Access, Attendance Automation, Gate Pass Workflow, Digital Communication.

Arogya: Digital Mental Health Support

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Our project addresses the problem of mental health issues like anxiety, depression, stress and sleep disorder in students in rural areas. Aarogya is a Digital platform with key features including secure real-time sessions with licensed psychologists, screening tools (PHQ-9, GAD-7, GHQ-12) for specific monitoring and an empathetic chatbot in regional languages offering positive responses, activities, and guidance. Stakeholders include students, psychologists, government, NGO and educational institutions. The tech involved app development, AI-powered chatbot and secure communication systems. The expected result is a reliable, accessible, and stigma-free digital platform that improves mental well-being and provides scalable mental health support.

Keywords: Mental Health Support, Digital Healthcare, AI Chatbot, Student Wellbeing, Rural Outreach.

IoT Guardian – Smart Device Vulnerability Scanner

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The rapid rise of IoT devices like smart TVs, cameras, routers, and bulbs has created new vulnerabilities in home networks. Many devices ship with weak credentials or outdated firmware, making them easy targets for cyberattacks. IoT Guardian scans local Wi-Fi networks to identify connected devices, assess their security, and highlight risks. Using CVE databases and weak credential checks, it assigns a security score and provides actionable recommendations. IoT devices often prioritize convenience over security, using lightweight protocols and unsecured communication channels. Manufacturers may delay updates or discontinue older models, leaving devices exposed. IoT Guardian continuously monitors the network, detects vulnerabilities, and educates users about device weaknesses. The system identifies devices via IP and MAC fingerprinting, categorizes them by type and manufacturer, and scans open ports such as Telnet, SSH, HTTP, or UPnP. Results are mapped against known CVEs to gauge risk. Weak credential detection simulates login attempts using common passwords to warn users, enabling immediate fixes like changing default credentials or enabling two-factor authentication. IoT Guardian translates technical data into a simple risk score based on open ports, CVE severity, outdated firmware, and weak credentials. Its visual dashboards display graphs, tables, and alerts, highlighting high-risk devices and simplifying decision-making. Continuous monitoring detects new or unauthorized devices in real time, while future features like firmware alerts, anomaly detection, and AI-driven behavior analysis promise a full IoT security framework. Designed ethically for local networks with user consent, IoT Guardian avoids intrusive testing and focuses on preventive security awareness. In summary, it offers an intelligent, user-friendly solution to safeguard IoT environments, empowering users to protect their smart homes and workplaces proactively.

Keywords: IoT Security, Network Scanning, Vulnerability Detection, Risk Assessment, Smart Device Protection.

FlowTrack: Integrating Security, Automation and Artificial Intelligence for Inventory Control

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FlowTrack is a secure and intelligent inventory management system designed to efficiently manage stock operations while ensuring data security. The system provides user authentication with role-based access, allowing authorized users to add, update, view, and manage inventory in real time. To protect sensitive data, encryption techniques and continuous activity monitoring are implemented. FlowTrack also integrates an AI-based chatbot to assist users by providing instant responses to inventory-related queries and report requests. Additionally, the system supports automated report generation and alerts for low stock levels. By combining cybersecurity features with automation and AI support, FlowTrack improves accuracy, security, and overall efficiency of inventory management.

Keywords: Inventory Management System, Role-Based Access Control, Data Security, AI Chatbot, Stock Automation.

FaceAttend — Smart AI-Based Face Recognition Attendance System

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The growing demand for automation and transparency in institutions and workplaces has emphasized the need for intelligent attendance systems capable of delivering real-time authentication and record management with minimal manual intervention. Traditional methods such as signature-based attendance, RFID card scanning, and fingerprint biometric systems suffer from impersonation risks, human error, card dependency, physical contact, and slower operational throughput. We introduce FaceAttend, an AI- powered smart attendance solution that automates attendance marking through camera-based face recognition and cloud-based record synchronization. FaceAttend requires no dedicated biometric hardware, operating entirely on standard webcams and internet-connected systems. Using deep-learning face detection, facial embedding–based identity verification, and liveness validation, the system provides fast, contactless, and proxy-resistant attendance recording. FaceAttend additionally features a cloud-connected dashboard for administrators, enabling attendance insights, downloadable reports, and real-time monitoring. Experimental results demonstrate that FaceAttend provides high reliability in normal lighting conditions, reduces time wastage significantly, and modernizes attendance processes without physical dependency or manual supervision.

Keywords: Face Recognition, AI Attendance, Contactless System, Automation, Cloud Sync.

AILAS – AI Legal Analyzer and Summarizer

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AILAS (AI Legal Analyzer & Summarizer) is an intelligent system designed to automate the analysis and summarization of complex legal documents such as FIRs, laws, registries, banking policies, and builder agreements. The system leverages Artificial Intelligence and Natural Language Processing to extract text from uploaded legal files, identify important clauses and entities, detect risks and obligations, and generate clear, concise summaries for easy understanding. AILAS follows a structured workflow where users select the document type, upload files, and receive AI-driven insights including key details, highlighted risks, and summarized obligations. The backend is implemented using Flask with advanced NLP libraries such as spaCy, PyTorch, and Hugging Face for efficient text processing and summarization, while PyMuPDF enables accurate document text extraction. The frontend uses modern web technologies to ensure smooth navigation and user interaction. Experimental results demonstrate improved processing speed, accurate clause detection, effective risk identification, and high user satisfaction. Overall, AILAS reduces manual effort, saves time, and makes legal information more accessible, supporting faster and more informed decision-making for legal professionals and students.

Keywords: Legal Document Analysis, NLP Summarization, Risk Detection, AI Automation, Decision Support.

RentMitra: Unified Solution for Digital Renting, Lease Renewal and Payment Automation

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The traditional rental management system relies heavily on manual processes, which often result in inefficient rent tracking, miscommunication between property owners and tenants, lack of proper documentation, and delays in rent collection and lease renewals. Managing multiple properties or tenants using conventional methods becomes time-consuming and prone to errors, leading to financial disputes and operational challenges. RentMitra is a smart digital rental management system developed to automate and streamline the entire rental lifecycle. The platform provides a centralized web-based solution that enables landlords and tenants to manage rent payments, track maintenance requests, handle lease renewals, and receive automated notifications in a secure and user-friendly environment. By digitizing rental records and communication, RentMitra reduces manual effort, improves transparency, and ensures timely transactions and updates. The system aims to enhance efficiency, minimize disputes, and simplify rental management by offering real-time access to data, improved coordination, and reliable digital documentation. RentMitra serves as an effective solution for modern rental management, making the renting process more organized, transparent, and convenient for both property owners and tenants.

Keywords: Rental Management System, Rent Automation, Digital Payments, Tenant Communication, Property Management.

CityPulse: A Technology-Driven Framework for Efficient Municipal Complaint Management

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CityPulse is a digital public service platform designed to simplify and modernize the process of reporting, tracking, and resolving city-related issues such as potholes, garbage accumulation, streetlight failures, water leakage, and public safety concerns. The system empowers citizens to directly submit complaints through an intuitive interface, where they can describe the issue, upload images, and mark the exact location using an interactive map. On the administrative side, authorized city officials can view, verify, assign, and update the status of complaints through a centralized dashboard. The platform includes role- based authentication, real-time email notifications, and an analytics module that provides insights into issue trends, response performance, and department efficiency. Developed using the MERN stack (MongoDB, Express.js, React.js, Node.js), CityPulse ensures scalability, secure data handling, and smooth communication between the citizen-facing interface and administrative backend. By replacing traditional manual reporting methods with a transparent and technology-driven workflow, CityPulse enhances accountability, accelerates problem resolution, and strengthens trust between the public and municipal authorities.

Keywords: Smart City Platform, Citizen Reporting, Issue Tracking, Digital Governance, Public Services.

FoodYatra - A Surplus Food Redistribution Platform

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Food waste and food insecurity continue to be serious challenges in India, where a large amount of edible food is wasted every year while millions of people struggle to meet their daily nutritional needs. The main reason for this imbalance is the lack of real-time coordination between food donors and organizations that can distribute surplus food efficiently. This project proposes Food Yatra, a web-based and AI-enabled platform designed to bridge this gap by enabling the timely redistribution of surplus food. Food Yatra connects food donors, including farmers, wholesalers, restaurants, hotels, and retailers, with verified NGOs and community kitchens through a unified digital interface. The system uses intelligent matching and route optimization techniques that consider factors like food type, quantity, perishability, distance, urgency, and NGO capacity to ensure food is delivered before spoilage. Real-time geolocation tracking and automated notifications help coordinate donors, NGOs, and volunteers efficiently. The platform also includes an analytics layer that analyzes historical data to identify food waste patterns, high-demand periods, and geographic hotspots. Interactive dashboards provide insights into donor activity, NGO fulfillment rates, response times, and the amount of food saved. To ensure trust and safety, the system incorporates verification mechanisms, digital transaction records, and standardized food safety information. With a multilingual, mobile-first design and scalable architecture, Food Yatra supports sustainable food management and aligns with the United Nations Sustainable Development Goals of Zero Hunger and Responsible Consumption.

Keywords: Food Waste Management, Food Redistribution Platform, AI-Based Matching, Route Optimization, Sustainable Development Goals.

AI Research Assistant: An Autonomous Multi-Agent System for Academic Literature Retrieval and Synthesis

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This work presents the AI Research Assistant, a specialized, autonomous multi-agent system designed to streamline the preliminary phases of academic research and technical scouting. In an era of exponential information growth, manually synthesizing recent literature is increasingly time-intensive. This system addresses that bottleneck by orchestrating a swarm of specialized AI agents—including a Researcher, Analyst, Formatter, and Archivist—to autonomously retrieve, analyze, and synthesize academic data. Built on a robust Python and Streamlit framework, the application integrates the Google Gemini Generative AI models with the ArXiv API to fetch and process real-time bibliographic data. Key technical innovations include a resilient network layer that implements API key rotation and exponential backoff to ensure continuous operation under rate limits, and a parallel processing engine that optimizes the formatting of citations and insights. The system visualizes research impact through dynamic radar charts and preserves user sessions via a persistent local memory architecture. By automating the extraction of strategic insights and generating APA-formatted reports with cross-platform resource links, the AI Research Assistant significantly reduces the cognitive load on researchers, enabling faster and more informed data-driven decision-making.

Keywords: AI Research Assistant, Multi-Agent Systems, Academic Literature Analysis, Generative AI, Automated Research Workflow.

AgriGyan: AI-Powered Crop Recommendation for Smarter Farming

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Modern agriculture is increasingly challenged by climate variability, soil heterogeneity, pest outbreaks, and fluctuating market demands, making traditional experience-based farming practices insufficient for consistent decision-making. Research shows that a rise of just 1 °C in temperature can reduce crop output value by nearly 21%, while combined variations in rainfall and temperature account for over 30% of global yield fluctuations, underscoring the sensitivity of agriculture to environmental change. To address these challenges, this work presents AgriGyan, an AI-powered crop recommendation and decision-support system designed to assist farmers with accurate, data-driven insights. The system employs advanced machine learning techniques, including decision trees, random forests, and neural networks, to analyze diverse inputs such as soil nutrient composition, pH, texture, historical yield data, real-time weather conditions, and market demand trends. Beyond crop suitability recommendations, AgriGyan integrates yield prediction and crop disease detection modules capable of identifying potential infections and suggesting appropriate pesticide or preventive measures. Farmers interact with the system through a responsive and user-friendly web interface, enabling real-time recommendations through seamless API integration. By minimizing guesswork, optimizing resource utilization, reducing risk, and promoting climate-resilient farming practices, AgriGyan empowers farmers to make informed, sustainable decisions that enhance both productivity and profitability. This study highlights the growing role of artificial intelligence in transforming agriculture into a smarter, adaptive, and technology-driven domain.

Keywords: AI in Agriculture, Crop Recommendation System, Machine Learning, Precision Farming, Climate-Resilient Agriculture.

Krishi Setu: A Digital Marketplace for Fair, Transparent and Sustainable Agricultural Trade

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Agriculture is the backbone of India's economy, but farmers still face many problems. Prices of food and essential items keep rising. In 2024, food inflation reached 8.4%, and rural inflation remained close to 7%. However, farmers earn less than 40% of what consumers pay. Middlemen control mandis and decide prices, and there is no strong system to monitor their actions. Most farmers also lack digital knowledge and are unaware of complex platforms like eNAM. To solve these problems, we propose Krishi Setu, a simple and transparent digital marketplace that directly connects farmers, buyers, and the government. Farmers can list their crops and sell through verified tenders, while buyers bid under government supervision to ensure fair pricing. The platform uses a secure wallet system where payments are released only after the product is delivered, ensuring safety and trust. Farmers can also rent out their equipment to earn additional income. The system makes every step clear and honest and helps the government track sales and payments. Krishi Setu aims to eliminate middlemen exploitation, increase farmer income, and provide consumers with fair prices. It is a step toward building a transparent, efficient, and sustainable agriculture system in India.

Keywords: Digital Agriculture Marketplace, Farmer–Buyer Direct Trade, Transparent Pricing, Secure Payment System, Agricultural Supply Chain.

FarmLink: A Digital Marketplace for Agricultural Products and Equipment Rental

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Agriculture continues to be a vital part of the Indian economy, yet farmers face persistent challenges such as lack of market access, reduced profit margins, and limited availability of modern equipment. To overcome these issues, this project proposes a Farm-to-Consumer E-Commerce Platform that allows farm-ers to directly sell agricultural products and rent or borrow farming equipment through a single, user-friendly digital interface. The system aims to eliminate intermediaries, promote fair trade, and empower small-scale farmers by offer-ing affordable access to essential tools and machinery. The platform is devel-oped using Java Full Stack technologies — Spring Boot, JSP, and RESTful APIs — for backend operations, and MongoDB for database management. The project follows an agile development methodology, integrating modules such as user authentication, product and equipment listing, rent and borrow manage-ment, order and payment processing, and admin control. Security features include JWT authentication, data encryption, and payment gateway integration to ensure safe and transparent transactions. This system not only simplifies the selling and renting process but also supports sustainable farming practices by reducing equipment duplication and fostering resource sharing. It aligns with the United Nations Sustainable Development Goals (SDGs) by promoting responsible consumption, economic growth, and digital empowerment in agri-culture. Overall, the project aims to create a transparent, secure, and sustain-able digital marketplace that connects farmers, consumers, and equipment owners to build a self-reliant agricultural ecosystem.

Keywords: Agri E-Commerce, Farm-to-Consumer, Equipment Sharing, Digital Marketplace, Sustainable Farming.

Student Talent Portal: A Web-Based System for Comprehensive Student Achievement Management System

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The Student Talent Portal is a web-based system designed to streamline the registration, management, and documentation of students' academic, co-curricular, and extracurricular achievements. It provides secure login using institutional credentials and allows students to create personalized profiles with essential personal and academic information. Achievements are categorized systematically, and verified documents can be uploaded and stored securely in the cloud. The platform includes smart filtering, interactive analytics, and visual dashboards to provide meaningful insights for students and faculty. An automated resume generator compiles student achievements into a professional format, improving record accuracy and presentation.

Keywords: Student Management System, Achievement Management, Cloud-Based Storage, Data Analytics, Resume Generation, Role-Based Access Control, Document Management, Data Visualization.

MediSmart: An Intelligent Mobile Application for Efficient Medicine Purchase, Inventory Management and Customer-Seller Coordination

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The proposed mobile application aims to provide a smart and affordable platform that connects customers with nearby medical stores, simplifying the process of buying and managing medicines. Customers can search and select required medicines, choose a nearby store or pharmacy, and book a convenient pickup time slot. This allows sellers to pre-pack orders in advance, saving customers valuable time. The app also supports prescription uploads, automatically detecting and suggesting medicines listed in the uploaded image to ensure accuracy and convenience. For sellers, the application includes a QR-based inventory management system that allows efficient stock organization. Scanning QR codes on medicine cartons provides details such as expiry date, manufacturing date, and shelf location. The system alerts sellers about medicines nearing expiry and enables franchise stores to share stock information across branches. Additional features enhance usability, including live stock availability, alternative medicine suggestions, loyalty points, medicine reminders, sales reports, and reorder notifications. Real-time notifications and an in-app chat system improve communication between customers and sellers. Future upgrades may include AI- based prescription reading, health record management, and online doctor consultations. Overall, the application promotes digital transformation in the pharmacy sector by saving time, improving accuracy, and ensuring seamless coordination between customers and medical store owners, making healthcare access faster, smarter, and more efficient.

Keywords: Medicine Management, Prescription Upload, QR-Based Inventory, Medicine Pickup Scheduling, Stock Monitoring, Expiry Alerts, Customer-Seller Coordination, Health Care Accessibility, Digital Pharmacy Solution, Health Record Management.

CivicSetu : Bridge Between People and Solutions

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This platform presents a digital, citizen-driven approach to enhance participation in city management and governance. It enables residents to actively report local issues such as potholes, damaged roads, faulty street lights, leaking pipelines, and other civic problems by submitting photographs along with location details. This ensures accurate reporting and faster identification of issues. To encourage continuous public engagement, the platform incorporates gamification elements such as points, digital rewards, leaderboards, and certificates. These features motivate citizens to participate responsibly and regularly. Once a complaint is submitted, the system assigns tasks to the appropriate municipal authorities. Users can also track the progress of their reports in real time, promoting transparency and accountability.By improving communication between citizens and local authorities, the platform strengthens trust and collaboration. Overall, it fosters civic responsibility, enhances service efficiency, and supports the development of well-managed, responsive, and sustainable urban environments.

Keywords: Smart City, Complaint Management, Citizen Engagement, Mobile Governance, Web Application, API Integration, Collaborative Tools.

FlowGuard: A Smart Traffic Management System for Dynamic Congestion Control and Emergency Corridor Creation in Indian Metros

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Urban traffic congestion in India is a critical challenge, characterized by significant economic losses and increased air pollution; vehicular emissions contribute approximately 27% of total air pollution, and cities like Mumbai and Delhi frequently rank among the world's most congested cities, with average travel times exceeding 33 minutes for just 10 km. Conventional fixed-time traffic signals are inadequate for this escalating problem. This paper presents the FlowGuard , a Smart Traffic Management System (STMS) and a responsive Cyber-Physical System (CPS). The FlowGuard uses a dense network of IoT sensors, including video cameras and ultrasonic devices, to gather real-time traffic data. This data is processed by a centralized control unit employing Machine Learning (ML) algorithms to analyze flow, predict congestion, and make intelligent, proactive decisions. The system's innovation lies in its combined use of adaptive signals and automated physical barriers, such as retractable bollards. This integration facilitates three key functions: Dynamic Lane Management for peak-hour efficiency; automatic formation of an Emergency Vehicle Corridor to reduce response times; and Enhanced Safety by controlling zone access. This system dynamically manages lanes and guarantees Emergency Vehicle Corridors to enhance road safety and drastically cut commute times. The FlowGuard is a transformative solution for building efficient, intelligent, and sustainable urban transportation networks in India.
Keywords: Real-time Data Analytics, IoT in Traffic, Cyber-Physical System (CPS), Dynamic Lane.

Class Vision: A Computer Vision–Based System for Real-Time Student Emotion Detection

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Class Vision is an intelligent system designed to enhance classroom engagement through the real-time analysis of student affect. Utilizing camera input and computer vision techniques, the system continuously detects and classifies facial expressions—such as happiness, sadness, anger, surprise, and neutrality—across the learning environment. By applying machine learning models, it translates visual data into actionable insights regarding the collective emotional state of the class. This provides educators with immediate, non-intrusive feedback, enabling them to adapt their teaching methods, content delivery, and classroom management strategies responsively. The project aims to foster a more attentive and supportive educational atmosphere by bridging the gap between student experience and instructional practice.
Keywords: Emotion Detection, Computer Vision, Facial Expression Recognition, Machine Learning, Smart Classroom Systems.

AEROBINS: Intelligent Odor-Controlled Waste Management Using IoT and Machine Learning

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Cleanliness is not only the things that we see; it is also the things that we sense, breathe, and keep for the future. Rapid urbanization and increased waste production have resulted in bad odors that, besides causing health hazards, are also damaging the environment. Most of the currently available smart waste programs only keep track of how full the bins are and do not pay attention to the very important aspect of odor detection. Since an odor is the earliest indication of decomposition and a source of diseases, thus, its treatment is necessary. This is an AI-powered Smart Waste Management System that uses predictive analytics to keep off the waste from being smelly, which is the essence of the project. The system installs gas sensors (MQ-135, MQ-4), environmental sensors (DHT22), and ultrasonic fill-level detection that are linked through NodeMCU/ESP32 to a cloud platform for real-time monitoring. It is a machine learning model that anticipates the generation of odors due to the decomposition of the waste before the occurrence of the event, thus, making it possible to intervene on time and also to collect the waste in an optimized way. By integrating odor prediction with AI-based route optimization, the device becomes a means of improving hygiene, reducing human labor, and being a reliable partner for a sustainable Smart City future.
Keywords: Smart Waste Management, Internet of Things (IoT), Artificial Intelligence (AI), Machine Learning, Odor and Gas Monitoring, Route Optimization, Smart City Infrastructure.

AquaSavvy: An IoT-Based Smart Irrigation System for Sustainable and Precision Farming

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Efficient water management is essential for sustainable agriculture, particularly in regions facing water scarcity. This project proposes an IoT-based Smart Irrigation System that integrates hardware sensing and software intelligence to optimize irrigation practices. The system employs soil moisture, temperature, and humidity sensors interfaced with a microcontroller (such as Arduino/ESP32) to continuously monitor field conditions. Based on real-time sensor data, irrigation decisions are automated using predefined thresholds, ensuring optimal water delivery while minimizing wastage. A dedicated mobile application enables farmers to remotely monitor environmental parameters, receive alerts, and manually control irrigation when required. The software layer also supports data logging and analysis to improve irrigation scheduling and crop management. By combining IoT hardware with a user-friendly software platform, the proposed system reduces human intervention, conserves water, and enhances crop productivity. The solution is cost-effective, scalable, and suitable for small to medium-scale farms, contributing significantly to sustainable and smart farming practices.
Keywords: Smart Irrigation System, Internet of Things (IoT), Sustainable.

ArogyaJal: An AI and IoT-Enabled Health Surveillance System for Early Detection of Water-Borne Disease Risks

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ArogyaJal is an AI- and IoT-enabled health surveillance and early warning system designed to mitigate water-borne disease risks in rural and semi-urban India. The system bridges gaps between fragmented water quality monitoring and delayed public health responses by integrating real-time sensing, community participation, and intelligent analytics. A low-cost IoT sensor kit comprising pH, TDS, turbidity, and temperature sensors, interfaced with an ESP32 and ADS1115 ADC, collects continuous water quality data and computes the Water Quality Index (WQI). This data is combined with symptom reports, manual water test results, and field observations gathered through a multilingual, offline-first mobile application used by citizens and health workers. A Spring Boot backend aggregates and preprocesses heterogeneous datasets, while a Flask-based machine learning engine applies DBSCAN clustering and Random Forest models to detect anomalies, identify potential outbreak hotspots, and generate risk scores. Insights are visualized through a centralized dashboard with live maps, alerts, and analytics, enabling faster, data-driven interventions.

Keyword: Water Quality Monitoring, IoT-Based Health Surveillance, Water-Borne Disease Detection, Machine Learning Analytics, Early Warning System.

SoilMetric: An IoT Based Soil Nutrition Monitoring and Decision Support System for Precision Agriculture

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Agriculture is increasingly shifting toward data-driven and precision-based practices, yet many existing soil monitoring systems suffer from fragmented data collection, delayed analysis, and limited decision-support capabilities. To address these challenges, this paper presents SoilMetric, an Internet of Things (IoT)-based Soil Nutrition Level Monitoring and Decision Support System that provides real-time, crop-specific insights through a web platform called GreenMitra. The system integrates in-situ sensors, including DHT11 temperature and humidity sensors, soil moisture sensors, and NPK sensors, interfaced with an ESP32 microcontroller. Sensor data is acquired using the Arduino IDE and transmitted wirelessly to Firebase, which functions as a real-time cloud database. The GreenMitra platform visualizes dynamic soil and environmental parameters and applies cloud-based analytical models to generate fertilizer recommendations and crop suitability insights based on predefined nutrient thresholds. Experimental evaluation demonstrated improved nutrient monitoring accuracy and effective fertilizer optimization, highlighting SoilMetric as a scalable and sustainable solution for precision agriculture.

Keywords: SoilMetric, Soil Nutrient Monitoring, Internet of Things (IoT), ESP32, Arduino IDE, Firebase, Precision Agriculture, Smart Farming, Cloud-Based Analytics, Sustainable Agriculture.

AI TRADING AGENT – An AIML Based Automated Trading System

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This work presents the design and implementation of an Artificial Intelligence (AI) and Machine Learning (ML)-based trading agent aimed at automating financial trading and improving decision-making accuracy. In dynamic financial markets, timely analysis of large volumes of market data is critical for identifying profitable trading opportunities. The proposed system integrates predictive analytics with automated trade execution to address these challenges. The AI Trading Agent employs advanced ML algorithms to analyze historical and real-time market data, forecast trends, and generate trading signals. The system follows a multi-layered architecture comprising a web-based user interface, RESTful API layer, AI/ML decision engine, and a PostgreSQL database for efficient data management. The front end, developed using Flask and Chart.js, provides real-time visualization of trading signals and portfolio performance. The backend supports secure integration with broker APIs such as Zerodha for automated trade execution. Rigorous testing and cloud deployment using Gunicorn and Nginx ensure scalability and reliability. Results demonstrate improved trading efficiency, faster decision-making, and reduced manual intervention.
Keywords: AI Trading Agent, Machine Learning, Automated Trading, Predictive Analytics, Financial Markets.

Smart Academic Companion (SAC): An AI-Driven Platform for Intelligent Academic Management

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The Smart Academic Companion (SAC) is an AI-driven platform designed to modernize institutional academic workflows by integrating fragmented processes into a unified digital ecosystem. It addresses challenges such as inefficient communication, manual record-keeping, and limited visibility into student performance. SAC supports three primary user groups: students, faculty, and administrators. Students access a centralized dashboard for assignments, attendance, performance analytics, and academic documents, while faculty can manage classrooms, share learning materials, evaluate submissions, and track student progress. Administrators benefit from a secure, paperless system that ensures transparency, accuracy, and data security. A key strength of SAC lies in its Artificial Intelligence capabilities. Gradient Boosting models analyze academic data to predict at-risk subjects and identify learning gaps, enabling timely academic interventions. Natural Language Processing (NLP) enhances communication through automated reminders and structured feedback. With features such as secure digital repositories, intelligent notifications, and interactive dashboards, SAC promotes data-driven decision-making and improved academic outcomes, supporting the transition toward smart and connected educational institutions.
Keywords: Smart Education, AI Analytics, Academic Management, Student Performance, Digital Campus.

Cyber-Physical Systems: Bridging the Physical World with Intelligent Computing

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Cyber-Physical Systems (CPS) represent the integration of computation, networking, and physical processes to develop intelligent and automated solutions for real-world problems. This project, developed under the CPS Lab, focuses on designing and implementing sensor-based systems that monitor, analyze, and respond to environmental and physical conditions in real time. The system utilizes various sensors such as temperature, humidity, gas, motion, light, and ultrasonic sensors to collect accurate data from the surroundings. These sensors act as the physical layer, while embedded controllers and software algorithms process the data and make intelligent decisions.

Keywords: Cyber-Physical Systems, Sensor-Based Monitoring, Embedded Systems, Real-Time Data Processing, Intelligent Automation.

Bridging the Digital and Physical World: Cyber-Physical Systems Lab

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This work details the establishment and objectives of a Cyber-Physical Systems (CPS) laboratory. The lab integrates key physical components—including a CO_2 monitoring device, BLE Gateway, Weather Shield, and a BME680 sensor—with computational systems for real-time environmental data acquisition. These tools enable monitoring of indoor air quality, atmospheric conditions, and facilitate reliable IoT communication. The primary objectives are to analyze and understand CPS architecture, bridge the gap between physical hardware and digital logic, and enable real-time data processing for system automation. By applying these integrated concepts to practical scenarios, the lab aims to enhance system reliability and provide a hands-on framework for implementing CPS solutions to address real-world problems.

Keywords: Cyber-Physical Systems, Real-Time Monitoring, Embedded Controllers, Sensor Integration, Intelligent Systems.

CourseBundler - AI Driven Subscription Learning Platform

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CourseBundler represents a comprehensive solution in the online education domain, combining modern web development frameworks, secure authentication, payment gateway integration, user personalization, and certification issuance. This platform has the potential to significantly elevate learner engagement and educator capability while addressing critical pain points in contemporary e-learning systems.

Keywords: MERN Stack, JWT, Subscription Platform, Online Education, Personalized Learning, Course Management, Payment Integration, Certification, Razorpay, ChakraUI.

NirmalCarbon: Carbon-Offset-as-a-Service(CoaaS)

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The growing urgency of climate change has pushed governments, consumers, and businesses to seek scalable, transparent, and low-cost ways to reduce or offset carbon emissions. Carbon credits are a well-established method for cutting emissions, but they lack scalability, transparency, and a focus on consumers, which limits access and adoption. This paper proposes NirmalCarbon, a digital platform that integrates verified carbon credit systems into everyday transactions for consumers. This allows businesses and consumers to offset their carbon emissions while also fostering loyalty and engagement. NirmalCarbon uses an API-driven infrastructure to connect partner businesses with verified carbon registries. It also includes a gamified loyalty system that rewards sustainable consumer behavior. The NirmalCarbon framework not only delivers measurable environmental benefits but also creates immediate and long-term business value by enhancing customer retention, differentiating brands, and generating new revenue from ESG initiatives. Backed by the insights of major consulting firms like McKinsey, Deloitte, and KPMG, this paper demonstrates that sustainability can fit well within the loyalty ecosystem. It can promote widespread sustainable consumer behavior without hurting profitability.

Keywords: Carbon Credits, Sustainability, Gamification, Digital Carbon Offsetting, Consumer Engagement, Green Loyalty.

Quick Path: An Intelligent Bilingual Route Optimization System for Smart City Transportation

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Rapid urbanization and increasing vehicular traffic, efficient route planning has become a major challenge in smart cities like Indore. Existing navigation systems primarily focus on the shortest distance, often ignoring factors such as fuel cost, toll charges, road conditions, and user accessibility. This paper proposes Quick Path, an intelligent bilingual route optimization system that utilizes Dijkstra's Algorithm and K-Shortest Path techniques to generate multiple optimized routes. Each route is analyzed based on distance, estimated travel time, fuel consumption, and toll costs. The system provides a bilingual interface (English and Hindi) and interactive map visualization using Spring Boot, MySQL, and mapping APIs, supporting sustainable and inclusive smart city transportation.

Keywords: Dijkstra's Algorithm, K-Shortest Path, Smart City, Bilingual Interface, Route Optimization, Intelligent Navigation System, Urban Mobility.

AniGuard: A Smart, Humane and Affordable Animal Intrusion Detection and Deterrent System for Indian Agriculture

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18% to the Agriculture supports over 58% of India's population and contributes nearly GDP. Yet, farmers face increasing threats from wild and stray animal intrusions, leading to major crop losses. According to the Ministry of Agriculture, India loses crops worth ₹8,000 crores annually due to animal attacks by elephants, wild boars, monkeys, and stray cattle. This not only affects food production but also creates conflicts between humans and wildlife. Traditional solutions like fencing, scarecrows, or manual guarding are costly, tiring, and often ineffective. To solve this, we propose AniGuard - a smart, low-cost, and eco-friendly animal detection and deterrent system. AniGuard uses Passive Infrared (PIR) sensors and Ultrasonic sensors to detect motion and distance. It is powered by an Arduino Uno, which processes real-time data to activate deterrents such as a buzzer and LED flashlights. The system is solar-powered and includes an optional GSM module to send instant alerts to the farmer's mobile phone. Field tests show that AniGuard detects animal movement within 3–5 meters and immediately triggers safe deterrent actions. It significantly reduces the need for constant human monitoring and avoids harming animals. AniGuard is easy to deploy, energy-efficient, and highly scalable. It offers a sustainable and humane solution to protect crops, especially for small and marginal farmers in rural India. The proposed system demonstrates how affordable automation and renewable energy can solve real-world problems in agriculture. AniGuard promotes peaceful coexistence between farmers and wildlife while enhancing productivity and resilience in Indian farming.

Keywords: PIR Sensor, Ultrasonic Sensor, Arduino Uno, GSM Module, Automation, Crop Protection, Animal Intrusion, Smart Farming, Renewable Energy.

Hoster: A Platform for Rental Home Search and Room Sharing

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EcoStay is a smart and eco-friendly web platform that helps students and working people find nearby rooms at affordable prices. At the same time, it allows homeowners to list their unused rooms and earn extra income. Instead of constructing new hostels or apartments, EcoStay encourages the use of existing rooms - saving space, money, and the environment. The system makes the room search process simple with smart filters, real-time communication, and verified profiles. By connecting people directly, it reduces the need for brokers and long-distance travel, which also helps lower fuel use and pollution. EcoStay aims to create a balance between comfort, cost, and sustainability while promoting responsible urban living.

Keywords: Sustainable Housing, Room Rental Application, Smart Urban Living, Verified Listings, Eco-Friendly Accommodation.

SoLink : A Dual Mode Full Stack Platform for Solar Energy Monitoring and Simulation

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In the wake of the increasing adoption of renewable energy, particularly solar power, a significant gap exists for end-users. Households and small solar plant operators often lack efficient, affordable, and accessible tools to monitor and optimize their energy usage. SoLink, proposes a full-stack software platform to address this challenge. The objective is to design and implement a cost-effective and comprehensive solar energy monitoring system. The system features a user friendly, responsive web dashboard that visualizes real-time and historical data. A key differentiator is SoLink's dual-mode functionality: a "Real Hardware Mode" for live monitoring via integration with actual inverters and a "Simulation Mode" that generates realistic data, enabling students, researchers, and developers to experiment and learn without requiring physical hardware. By bridging affordability and usability, SoLink empowers users with actionable insights for sustainable energy management.

Keywords: Solar Monitoring System, IoT Simulation, Renewable Energy Analytics, Energy Visualization, Flask Backend, Full-Stack Web Development.

Smart City Intelligent Surveillance System

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Rapid urbanization has led to an exponential increase in surveillance infrastructure across smart cities. However, existing surveillance systems remain largely passive, fragmented, and reactive, limiting their effectiveness in ensuring public safety. The proposed Smart City Intelligent Surveillance System addresses three major challenges: (1) lack of real-time threat detection, (2) inefficient analysis of massive multi-camera video data, and (3) delayed response due to minimal system intelligence and coordination. Current systems primarily rely on human monitoring, which is error-prone, resource-intensive, and incapable of handling large-scale real-time data streams. This results in missed incidents, slow emergency response, and underutilization of surveillance data. To overcome these limitations, our solution integrates AI-powered video analytics, edge computing, and centralized command intelligence to enable proactive surveillance. The system employs computer vision and deep learning models for real-time detection of anomalies, suspicious activities, traffic violations, and public safety threats across distributed camera networks. Edge-level processing ensures low latency and scalability, while a central dashboard aggregates insights, generates alerts, and assists authorities in rapid decision-making. Privacy-preserving mechanisms and role-based access control are incorporated to ensure ethical and secure surveillance. By transforming conventional surveillance into an intelligent, predictive, and responsive system, this solution enhances urban safety, optimizes resource utilization, and supports data-driven governance—making it a critical component of future-ready smart cities.

Keywords: Smart City, Intelligent Surveillance, Artificial Intelligence, Computer Vision, Edge Computing, Real-Time Threat Detection, Public Safety.

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