

4TH

NIELIT's International Conference on
Communication, Electronics & Digital Technologies

NICEDT-2026

29th & 30th January 2026



Abstract Book

Conference Organiser

National Institute of Electronics and Information Technology
Ministry of Electronics and Information Technology (MeitY), Govt. of India

4TH NIELIT International Conference on Communication, Electronics and Digital Technologies 2026

29th & 30th January 2026



Abstract Book

Venue:

Courtyard By Marriott, Gorakhpur, U.P.

Organiser:

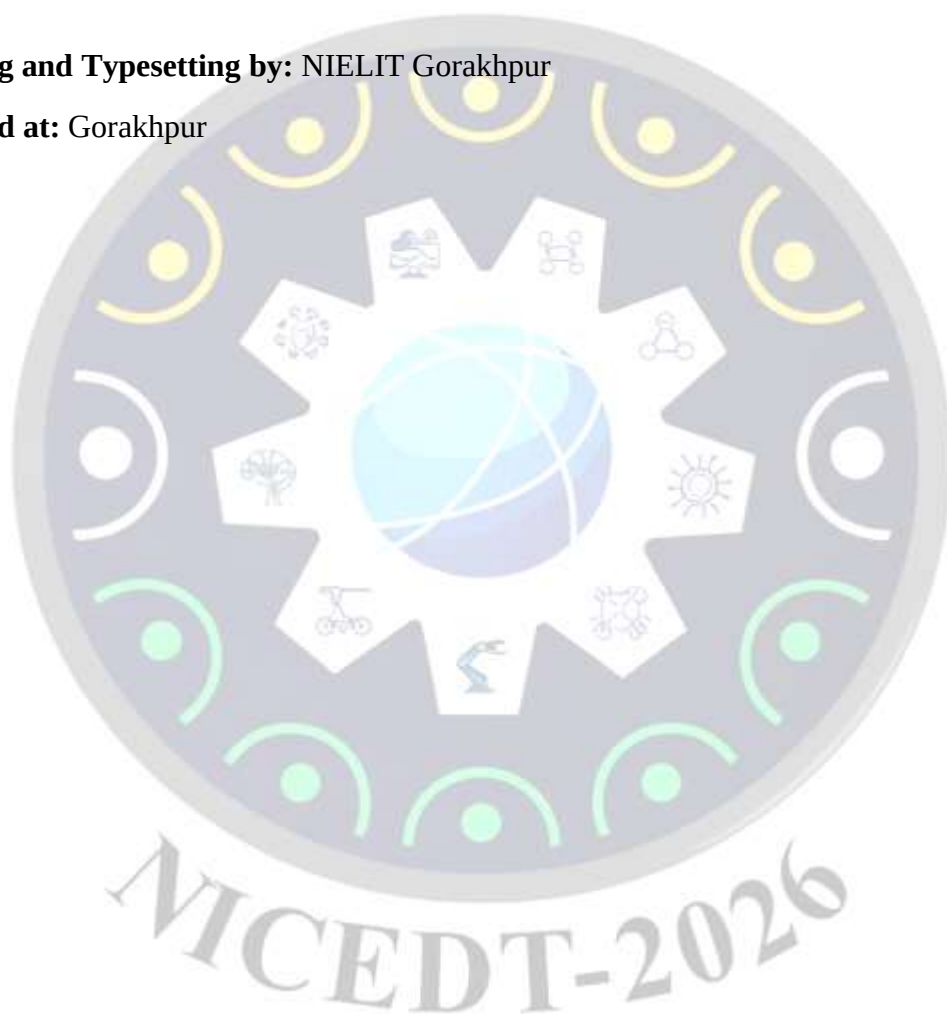
National Institute of Electronics and Information Technology, Gorakhp

Ministry of Electronics and Information Technology (MeitY), Govt. of India

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Editing and Typesetting by: NIELIT Gorakhpur

Printed at: Gorakhpur



Message from Hon'ble Secretary

S. Krishan, IAS

Secretary

Ministry of Electronics & IT,

Government of India



I am delighted to extend a warm welcome to all participants of the 4th NIELIT International Conference on Communication, Electronics and Digital Technologies (NICEDT-2026), being organized on 29th and 30th January 2026 at NIELIT Gorakhpur.

Over successive editions, NICEDT has established itself as a distinguished forum for scholarly discourse and collaborative engagement in the fields of communication, electronics, and digital technologies. It is gratifying to note that NICEDT-2026 builds upon this strong foundation with a focused emphasis on research and development in the rapidly evolving technological ecosystem, particularly in areas such as Artificial Intelligence, digital transformation, and other emerging domains.

NICEDT-2026 provides an excellent platform for researchers, academicians, industry professionals, and policymakers to deliberate on critical themes such as Digital Technologies for Future Applications, Assistive Technologies for Divyangjan, and strategic approaches to Digital Skilling for building a globally future-ready workforce. As we navigate an increasingly complex technological landscape, it is imperative that innovation remains human-centric, ethical, and inclusive.

I convey my best wishes to the organizing committee and all participants for the successful conduct of NICEDT-2026 and trust that the conference will foster meaningful deliberations, enduring collaborations, and impactful outcomes.

Message from Hon'ble Vice Chancellor NDU & DG NIELIT

Prof. (Dr.) M. M. Tripathi

VC NIELIT Deemed to be University & DG NIELIT



I am delighted to extend a warm welcome to all delegates, researchers, academicians, and industry professionals participating in the 4th NIELIT International Conference on Communication, Electronics and Digital Technologies (NICEDT-2026), following the resounding success of its previous editions held in New Delhi (2023), Guwahati (2024), and Ropar (2025).

It gives me immense pleasure to share that NICEDT-2026 is being organized on 29th and 30th January 2026 at NIELIT Gorakhpur, a centre that plays a significant role in promoting digital education, skilling, and research in the region. The conference reaffirms NIELIT's steadfast commitment to academic excellence, innovation, and capacity building in the rapidly evolving technological ecosystem.

NICEDT-2026 provides a comprehensive platform to deliberate on cutting-edge research and innovations across diverse domains, including Artificial Intelligence, Machine Learning, Big Data Analytics, Cyber Security and Forensics, Network and Mobile Security, Advanced Computing, Blockchain and Web Technologies, VLSI and Semiconductor Technologies, Electronic Systems, Internet of Things, Microwave, Antenna, and Communication Technologies. Special emphasis has also been placed on Digital Technologies for Future Applications, Assistive Technologies for Divyangjan, and strategic initiatives for Digital Skilling aimed at building a globally future-ready workforce.

The conference aims to foster meaningful interactions among researchers, professionals, and policymakers, encouraging knowledge exchange and collaborative research. I extend my sincere appreciation to all authors, speakers, panelists, reviewers, and members of the organizing committees for their invaluable contributions. I also express my gratitude to Springer for their continued association and support in disseminating the scholarly outcomes of NICEDT-2026 through their esteemed book series, Lecture Notes in Networks and Systems. I am confident that NICEDT-2026 will serve as a catalyst for impactful discussions, innovation, and enduring collaborations in the field of digital technologies.

Warm Regards,

Thank you

Message from Conference Chair

Dr. D. K. Mishra

Director, NIELIT Gorakhpur



It is with great pleasure that we extend our warmest welcome to all delegates to the 4th NIELIT International Conference on Communication, Electronics and Digital Technologies (NICEDT-2026). Building upon the strong foundation and success of the earlier editions held in New Delhi (2023), Guwahati (2024), and Ropar (2025), we are delighted to host NICEDT-2026 on 29th and 30th January 2026 at NIELIT Gorakhpur.

NICEDT-2026 has evoked an overwhelming response from the global research community, with more than 500 full-length papers submitted by researchers from academia, industry, and leading research organizations worldwide. Each submission underwent a rigorous and transparent peer-review process involving the Program Committee (PC), External Program Committee (EPC), External Review Committee (ERC), along with additional subject-matter experts, ensuring the highest standards of academic quality and technical rigor. Authors were provided adequate opportunities to address reviewers' comments and refine their manuscripts.

Following a meticulous evaluation process, 146 high-quality papers have been selected for presentation at the conference, reflecting the depth, diversity, and relevance of contemporary research in the fields of communication, electronics, and digital technologies. The technical program features contributions from eminent researchers and industry professionals, offering rich insights into emerging trends and real-world applications.

We express our sincere gratitude to the leadership and staff of NIELIT, senior officials from MeitY, members of the steering and technical committees, reviewers, panelists, academicians, and industry experts for their invaluable guidance and support. We also gratefully acknowledge the contributions of our sponsors and partners, whose support has been instrumental in the successful organization of NICEDT-2026.

Once again, we extend a very warm welcome to all participants and look forward to engaging discussions, meaningful collaborations, and a rewarding conference experience at NICEDT-2026.

Warm Regards,

Thank you

Message from Organizing Secretaries

It is with great pleasure and enthusiasm that we extend a warm welcome to all participants and distinguished guests to the 4th NIELIT International Conference on Communication, Electronics and Digital Technologies (NICEDT-2026), scheduled to be held on 29th and 30th January 2026 at NIELIT Gorakhpur. This prestigious conference promises to be an enriching and intellectually stimulating experience, bringing together academicians, researchers, industry leaders, policymakers, and professionals from across the country and around the world. Drawing inspiration from the remarkable success of NICEDT-2025 held at NIELIT Ropar, and the earlier editions organized at New Delhi (2023) and Guwahati (2024), NICEDT-2026 continues its legacy of fostering excellence in research, innovation, and collaborative engagement. The conference features a thoughtfully curated technical program comprising keynote addresses, technical sessions, and panel discussions that explore the frontiers of technological advancement. The thematic coverage spans a broad spectrum of emerging and contemporary domains, including Artificial Intelligence, Cyber Security, Quantum Computing, Blockchain Technologies, Advanced Computing, Electronics, and Communication Systems, offering participants a comprehensive perspective on the evolving digital landscape. The conference is being hosted in Gorakhpur, a city of historical, cultural, and educational significance in eastern Uttar Pradesh. Renowned as the spiritual seat of Mahayogi Guru Gorakhnath, Gorakhpur has emerged as an important hub for education, healthcare, and digital skilling in the region. With the presence of premier institutions such as NIELIT Gorakhpur, AIIMS Gorakhpur, and multiple universities, the city provides an ideal environment for academic discourse, innovation, and knowledge exchange.

We are confident that NICEDT-2026 will serve as a catalyst for meaningful dialogue, interdisciplinary collaboration, and innovation, fostering new ideas and partnerships that will drive progress in the ever-evolving fields of communication, electronics, and digital technologies. Once again, we extend a heartfelt welcome to all participants and look forward to insightful discussions, enriching interactions, and a rewarding conference experience at NICEDT-2026.

Warm regards,

Sh. Rajneesh Asthana

Sh. Abhinav Mishra

Sh. Anurag Govind Rao

Organising Secretaries, NICEDT-2026

Organizers

❖ Chief Patron

- Shri S. Krishnan, IAS
Secretary, Ministry of Electronics and Information Technology (MeitY), Govt. of India.

❖ Patron

- Dr. Madan Mohan Tripathi
Hon'ble VC, NIELIT Deemed to be University & Director General, NIELIT.

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- Dr. Jayaraj U Kidav, Executive Director, NIELIT, Aurangabad
- Dr. D.K. Mishra, Director, NIELIT Gorakhpur
- Dr. Manish Arora, Director, NIELIT Ropar
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- Prof. Tzung-Pei Hong, National University of Kaohsiung, Taiwan
- Prof. Paolo Ciancarini, University of Bologna, Italy

❖ Conference Chairs

- Dr. Sanjay Kumar Dhurandher, Executive Director, NIELIT HQ
- Dr. D. K. Mishra, Director, NIELIT Gorakhpur
- Dr. Alok Tripathi, Director, NIELIT HQ

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- Sh. Abhinav Mishra, Joint Director, NIELIT Gorakhpur
- Sh. Anurag Govind Rao, Joint Director, NIELIT Gorakhpur
- Sh. Arun Mani Tripathi, Joint Director, NIELIT Gorakhpur
- Dr Muneer Ahmad Dar, Joint Director, NIELIT Ropar
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- Dr Sarwan Singh, Joint Director, NIELIT Ropar
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- Sh. Ritesh Pratap Rao, Deputy Director, NIELIT Gorakhpur
- Sh. Prashant Pal, Deputy Director, CoE Noida
- Dr Smita Sharma, NIELIT HQ
- Dr. Saurov Mahanta, STO, NIELIT Guwahati
- Smt. Indulata Gupta, TO, Gorakhpur
- Sh. Ajay Verma, TO, NIELIT Gorakhpur
- Sh. Arjesh Jha, STA, NIELIT Gorakhpur
- Sh. Neeraj Kumar, STA, NIELIT Gorakhpur

About National Institute of Electronics and Information Technology (NIELIT)

National Institute of Electronics and Information Technology (NIELIT), (erstwhile DOEACC Society), an autonomous scientific society under the administrative control of Ministry of Electronics and Information Technology (MeitY), Government of India was set up to carry out Human Resource Development and related activities in the area of Information, Electronics & Communications Technology (IECT). NIELIT is both in Formal and Non-Formal Education in the area of IECT besides development of industry-oriented quality education and training programmes in state-of-art areas. NIELIT has endeavoured to establish standards to be the country's premier institution form Examination and Certification in the field of IECT. It is also one of the National Examination Body, which accredits institutes/organisations for conducting courses in IT in the non-formal sector. As on date, NIELIT has 47+ centres located at Agartala, Aizawl, Ajmer, Alawalpur (Saksharta Kendra), Aurangabad, Bhubaneswar, Calicut, Chandigarh, Chennai, Chuchuyimlang, Churachandpur, Daman, Delhi, Dibrugarh, Dimapur, Gangtok, Gorakhpur, Guwahati, Haridwar, Imphal, Itanagar, Jammu, Jorhat, Kargil, Kohima, Kokrajhar, Kurukshetra, Lakhanpur (Saksharta Kendra), Leh, Luchnow, Lunglei, Majuli, Mandi, Pasighat, Patna, Pali, Ranchi, Ropar, Senapti, Shillong, Shimla, Shilchar, Srinagar, Tezpur, Tura and Tezu with its Headquarters at New Delhi. It is also well-networked throughout India with the presence of 700+ institutes.

NIELIT has been granted the status of Deemed to be University under distinct category from UGC with Ropar centre as main campus and 11 other NIELIT centres at Agartala, Aizwal, Aurangabad, Calicut, Gorakhpur, Imphal, Itanagar, Kekri(Ajmer), Kohima, Patna, Srinagar as its constituent units.

Over the last two decades, NIELIT has acquired very good expertise in IT training. through its wide repertoire of causes, ranging from 'O' Level (Foundation). 'A' Level (Advanced Diploma). 'B' Level (MCA equivalent), 'C' Level (MTech level), IT literacy courses such as CCC (Course on Computer Concept), BCC (Basic Computer Course), and other such long-term and short-term courses in the non-formal sector like courses on Information Security, ITeS-BPO (Customer Care/Banking), Computer Hardware Maintenance (CHM-O/A level), Bioinformatics (BI- O/AB level), ESDM, etc., besides high-end courses offered by NIELIT centres at Post-Graduate level (MTech) in Electronics Design & Technology, Embedded Systems, etc., which are not normally offered by Universities Institutions in the formal sector, in association with the respective state Universities.

The basket of activities of NIELIT is further augmented by the wide range of projects that it undertakes. NIELIT has demonstrated its capability and capacity to undertake R&D projects, consultancy services, turnkey projects in office automation, software development, website development, etc. NIELIT is also the nodal implementing agency on behalf of MeitY for Data Digitisation of the population of 15 assigned States and 2 Union Territories for the creation of National Population Register (NPR) project of Registrar General of India (RGI). NIELIT is also successfully executing the Agriculture Census and Input Survey project which tabulation of about 10 crore data records have to be done. NIELIT has planned a roadmap for adopting appropriate pedagogy for metamorphosing NIELIT into an Institute of National Importance.

About 4th NIELIT's International Conference on Communication, Electronics and Digital Technologies (NICEDT-2025), 29-30 January 2026, Gorakhpur, India

The NIELIT International Conference on Communication, Electronics and Digital Technologies (NICEDT-2026) is the 4th International Conference being organized by the National Institute of Electronics and Information Technology (NIELIT). The conference will be held on 29th–30th January 2026 Courtyard By Marriott, Gorakhpur, Uttar Pradesh, India.

NICEDT-2026 aims to showcase and disseminate recent research, innovations, and developments in the domains of Information, Electronics, and Communication Technologies (IECT) and allied interdisciplinary areas. The conference is designed to bring together a diverse and vibrant community of researchers, academicians, industry professionals, policymakers, and enthusiastic students from across the globe, fostering meaningful exchange of ideas and collaborative research.

The conference has invited high-quality research papers across the following eight thematic tracks:

TRACKS	AREAS
Track 1	Artificial Intelligence, Machine Learning, and Big Data Analytics
Track 2	Cyber Security and Forensics, Network and Mobile Security
Track 3	Advanced Computing – Cloud Computing, Edge Computing, and Quantum Computing
Track 4	Blockchain and Web Technologies
Track 5	VLSI, Semiconductors, Electronic Systems, Internet of Things (IoT), Microwave, Antenna, and Communication Technologies
Track 6	Digital Technologies for Future Applications (Biotechnology, Augmented Reality, Virtual Reality, Metaverse, etc.)
Track 7	Assistive Technologies for Divyangjan
Track 8	Strategies for Digital Skilling to Build a Globally Future-Ready Workforce

This two-day international conference will focus on sharing cutting-edge research findings and practical advancements in IECT and related areas. NICEDT-2026 will serve as an ideal platform for knowledge dissemination, professional interaction, and interdisciplinary collaboration, enabling participants to present their work, exchange insights, and contribute to the advancement of digital technologies in alignment with national and global priorities.

Guest of Honour:

Shri Alkesh Kumar Sharma, IAS(Retd.)

Member, Public Enterprises Selection Board (PESB)



Shri Alkesh Kumar Sharma is a distinguished senior civil servant and presently serves as a Member of the Public Enterprises Selection Board (PESB), the apex body responsible for the selection of top management leadership in Central Public Sector Enterprises (CPSEs) under the Government of India. He brings with him vast experience in public administration, policy formulation, and strategic governance.

Over an illustrious career in the Indian Administrative Service (IAS), Shri Sharma has held several key leadership positions at the State and Central Government levels, contributing significantly to infrastructure development, power sector reforms, industrial growth, and institutional strengthening. He has been closely associated with major national initiatives and reforms aimed at enhancing efficiency, transparency, and performance in public sector enterprises.

As a Member of PESB, Shri Sharma plays a crucial role in evaluating leadership capabilities, governance standards, and strategic vision of senior executives, thereby shaping the future leadership of India's CPSEs. His deep understanding of public sector management, regulatory frameworks, and organizational leadership adds immense value to the Board's mandate.

Widely respected for his administrative acumen, integrity, and strategic insight, Shri Alkesh Kumar Sharma continues to contribute meaningfully to strengthening corporate governance and leadership excellence in India's public sector ecosystem.

Guest of Honour:

Prof. K. G. Upadhyay

Ombudsperson

NIELIT Deemed to be University



Prof. K. G. Upadhyay is the Ombudsman of NIELIT Deemed to be University and a retired Professor in the Department of Electrical Engineering at Madan Mohan Malaviya University of Technology (MMMUT), Gorakhpur. He brings with him decades of distinguished experience in engineering education, research, and academic administration, along with a deep commitment to ethical governance, transparency, and institutional accountability.

Throughout his academic career, Prof. Upadhyay has made valuable contributions to curriculum development, teaching, and mentoring of undergraduate, postgraduate, and doctoral students. He is widely respected for his scholarly rigor, balanced judgment, and people-centric approach. His expertise in quality assurance, student welfare, and regulatory compliance has been instrumental in strengthening academic systems and governance practices.

In his role as Ombudsman, Prof. Upadhyay plays a pivotal role in addressing grievances, safeguarding stakeholder interests, and upholding the principles of natural justice within the university.

Prof. K. G. Upadhyay extends his best wishes for the grand success of NICEDT 2026, and expresses confidence that the conference will foster meaningful dialogue, collaborative research, and technological innovation in the fields of electronics, communication, and digital technologies.

Guest of Honour:

Dr. Neerja Gupta

Vice-Chancellor Gujarat University



Dr. Neerja Gupta is the Vice-Chancellor of Gujarat University, Ahmedabad, Gujarat, India. She previously served as Vice-Chancellor of Sanchi University of Buddhist-Indic Studies, M.P., India, and as Principal of Bhavan's College, Gujarat. With a Doctorate in English and over 39 years of academic, research, and administrative experience, she has been instrumental in shaping higher education and research initiatives in India. Dr. Gupta is the Chief Editor of Bharatiya Manyaprad, an international research journal, and has authored 24 books and over 60 publications, including research papers, journal articles, and book chapters. She has successfully guided 29 Ph.D. scholars.

Dr. Gupta is proficient in two foreign languages (Russian and Greek) and nine Indian languages, and her research spans English, Sanskrit, Pali, Gujarati, Hindi, Indology, Gandhian thought, Indian culture, migration studies, and ancient Indian poetics. She has contributed to national initiatives, including serving as Principal Director for studies on Jammu and Kashmir, and has participated in over 400 national and international conferences.

She has received several prestigious awards, including the Bharat Kirtiman Padak (2023), Lifetime Achievement Award (Udgam Trust), Aaj Ka Karmveer Award (2022), Bharat Manthan Award (2020), and Atal Bihari Vajpayee Rashtriya Sanman (2017). Dr. Gupta has traveled extensively to 48 countries for academic and strategic collaborations, and has actively contributed to disaster relief, international educational delegations, and interfaith initiatives.

Guest of Honour:

Prof. Anu Singh Lather

Vice-Chancellor

Dr. B. R. Ambedkar University Delhi



Prof. Anu Singh Lather is the Vice-Chancellor of Dr. B. R. Ambedkar University Delhi and a distinguished academician with wide-ranging experience in higher education leadership, academic governance, and interdisciplinary scholarship. She is widely recognized for her commitment to liberal, inclusive, and socially responsive education, aligning academic institutions with contemporary societal and national priorities.

As Vice-Chancellor, Prof. Lather has played a pivotal role in strengthening academic quality, institutional governance, and research culture at Dr. B. R. Ambedkar University Delhi. Her leadership emphasizes student-centric learning, curriculum innovation, interdisciplinarity, and equity in access to education. She has been instrumental in promoting policies and practices that foster critical thinking, ethical reasoning, and civic engagement among students.

Prof. Lather has also contributed significantly to policy formulation and academic administration, serving on various statutory bodies, academic councils, and advisory committees at state and national levels. Her work reflects a deep engagement with issues of social justice, democratic values, and the transformative role of universities in society.

A respected mentor and thought leader, Prof. Anu Singh Lather continues to advance progressive educational reforms, research-driven learning, and institutional excellence, reinforcing Dr. B. R. Ambedkar University Delhi's position as a leading public university committed to academic rigor and social responsibility.

Guest of Honour:

Prof. (Dr.) Devinder Singh

Vice-Chancellor

Dr. B.R. Ambedkar National Law University (DRBRANLU), Sonipat



Prof. (Dr.) Devinder Singh is the Vice-Chancellor of Dr. B.R. Ambedkar National Law University (DRBRANLU), Sonipat, and a distinguished academic administrator with extensive experience in legal education, academic governance, and institutional development. He is widely respected for his contributions to law teaching, research, and policy-oriented legal scholarship.

With a strong academic background in law and legal studies, Prof. Singh has held several senior academic and administrative positions, contributing significantly to curriculum design, quality assurance, and research promotion in higher education. His academic work reflects a commitment to interdisciplinary legal research, constitutional values, and social justice, aligned with the vision of Dr. B.R. Ambedkar.

As Vice-Chancellor, he has spearheaded initiatives to strengthen research culture, academic rigor, and national and international collaborations at DRBRANLU. Under his leadership, the University has emphasized experiential learning, legal innovation, and professional skill development for law students.

Prof. (Dr.) Devinder Singh actively engages with judicial bodies, academic institutions, and policy forums, and is known for his inclusive leadership, academic integrity, and dedication to capacity building. His leadership continues to shape DRBRANLU as a center of excellence in legal education and research.

Guest of Honour:

Dr. Poonam Tandon

Vice-Chancellor

Deen Dayal Upadhyay Gorakhpur University, Gorakhpur



Dr. Poonam Tandon is the Vice-Chancellor of Deen Dayal Upadhyay Gorakhpur University and a distinguished academic leader with extensive experience in higher education, research, and institutional governance.

With a sustained record of scholarly research and teaching excellence, Dr. Tandon has published widely in reputed national and international journals and has actively contributed to curriculum development, outcome-based education, and academic quality enhancement. Her work emphasizes the integration of emerging technologies, interdisciplinary research, and digital innovation into mainstream higher education.

As Vice-Chancellor, she has led significant initiatives to strengthen research culture, industry–academia collaboration, and skill-oriented learning at Deen Dayal Upadhyay Gorakhpur University. Under her leadership, the University has enhanced its focus on innovation-driven education, digital skill development, and inclusive academic practices for students and faculty.

Dr. Tandon is widely respected for her visionary leadership, commitment to academic excellence, and mentorship of young scholars. She actively engages with national academic bodies and professional forums, contributing to discussions on technology-enabled education and research advancement. Her association with NICEDT-2026 adds significant academic value and leadership perspective to the conference discourse.

Guest of Honour:

Mr. Sushil Pal

Joint Secretary

Ministry of Electronics and Information Technology (MeitY),
Government of India



Mr. Sushil Pal is a Joint Secretary in the Ministry of Electronics and Information Technology (MeitY), Government of India, with extensive experience in policy formulation, program implementation, and governance of India's electronics and digital ecosystem. In his role, he is actively involved in steering key national initiatives related to electronics manufacturing, digital infrastructure, cybersecurity, e-governance, and emerging technologies.

He has contributed significantly to the design and execution of large-scale government programs, working closely with central ministries, state governments, industry stakeholders, and academic institutions. His responsibilities include strategic planning, inter-ministerial coordination, and monitoring of flagship projects aligned with Digital India, Make in India, and Atmanirbhar Bharat missions.

Known for his administrative acumen and technology-oriented approach, Mr. Pal plays an important role in fostering public-private partnerships, innovation-driven policy frameworks, and capacity-building initiatives. His work continues to support the development of a secure, inclusive, and globally competitive digital economy, strengthening India's leadership in electronics, information technology, and digital governance.

Guest of Honour:

Dr. Tripta Thakur

Vice Chancellor

Uttarakhand Technical University



Dr. Tripta Thakur is the Vice-Chancellor of Uttarakhand Technical University, Dehradun, where she provides visionary academic and administrative leadership aimed at strengthening technical education, research excellence, and innovation-driven learning. With an accomplished career spanning academia, research, and higher-education governance, she has made significant contributions to the advancement of engineering education and institutional development. she was Director General of National Power Training Institute Ministry of Power and undertook various initiative in Power Sector Training and capacity building

Under her leadership, Uttarakhand Technical University has undertaken initiatives focused on curriculum modernization, outcome-based education, accreditation, and industry collaboration, aligning academic programs with national priorities such as skill development, entrepreneurship, and emerging technologies. She has been instrumental in promoting research culture, faculty development, and student-centric reforms, fostering an environment conducive to academic excellence and innovation.

Dr. Thakur has held several key academic and administrative positions prior to her current role, contributing to policy formulation, academic planning, and quality assurance in higher education. A committed mentor and educationist, she has guided students and faculty alike and actively supported women's participation and leadership in science and engineering.

She is associated with various statutory bodies, academic councils, and expert committees, and regularly engages with national forums on higher education reform. Dr. Tripta Thakur is widely respected for her integrity, leadership, and dedication to capacity building, and continues to play a pivotal role in shaping technical education in Uttarakhand and beyond.

Guest of Honour:

Ms. Tulika Pandey

Group Coordinator (HRD)

Ministry of Electronics and Information Technology (MeitY)



Ms. Tulika Pandey serves as the Group Coordinator (Human Resource Development) at the Ministry of Electronics and Information Technology (MeitY), Government of India. In this strategic role, she is closely associated with the planning, formulation, and implementation of national HRD and capacity-building initiatives in the domains of electronics, information technology, and emerging digital technologies.

Her work focuses on strengthening India's skilling ecosystem, aligning education and training frameworks with industry needs, and supporting flagship national missions such as Digital India, Skill India, and Atmanirbhar Bharat. She has been actively involved in coordinating programs related to IT and electronics skill development, digital literacy, faculty development, and institutional capacity building, in collaboration with government bodies, academic institutions, and industry partners.

Ms. Pandey is recognized for her policy-oriented approach, inter-ministerial coordination skills, and commitment to workforce development. Through her leadership, MeitY's HRD initiatives continue to contribute to building a future-ready, globally competitive digital workforce, supporting innovation, inclusion, and sustainable growth in India's technology ecosystem.

Guest of Honour:

Dr. P. Hanumantha Rao

Director General, SAMEER



Dr. P. Hanumantha Rao is the Director General of the Society for Applied Microwave Electronics Engineering and Research (SAMEER), an autonomous R&D organization under the Ministry of Electronics and Information Technology (MeitY), Government of India. He received his Ph.D. from The Queen's University, Belfast, UK, M.S. from BITS Pilani, and B.Tech. from Sri Venkateswara University, India. With over 34 years of experience in RF, microwave, and mm-wave technologies, he has made pioneering contributions to indigenous 5G and 6G systems, MIMO and Massive MIMO architectures, mm-wave phased array antennas, RF SoC/SoP solutions, and strategic electronic technologies.

Dr. Rao has been instrumental in building national R&D infrastructure, fostering multi-institutional collaborations with IITs, IISc, and international partners, including Georgia Tech, USA. He has authored over 120 publications in reputed journals, received multiple IEEE Best Paper and Most Popular Paper awards, and served as IEEE Distinguished Lecturer for the Asia-Pacific region. He has also been recognized as a UNDP Fellow and British Commonwealth Fellow, contributing to global research and capacity-building initiatives.

His current research focuses on 6G solutions, intelligent reflecting surfaces, UAV detection and mitigation, spectrum studies, and next-generation phased array systems. Through his technical leadership, mentoring, and strategic vision, Dr. Rao continues to strengthen India's self-reliance in advanced electronic technologies.

Guest of Honour:

Shri M. Vellaipandi

Director General

Standardisation Testing and Quality Certification (STQC)



Shri M. Vellaipandi is the Director General of Standardisation Testing and Quality Certification (STQC), a premier quality assurance and certification organization under the Ministry of Electronics and Information Technology (MeitY), Government of India. STQC plays a critical role in ensuring quality, reliability, and security of electronic products, software, and IT systems across government and industry domains.

As Director General, Shri Pandi provides strategic leadership in strengthening testing, calibration, certification, and audit services in areas such as electronics hardware, software quality, cybersecurity, e-governance systems, and digital infrastructure. He has been actively involved in aligning STQC's frameworks with national and international standards, supporting flagship initiatives including Digital India, Make in India, and Atmanirbhar Bharat.

With extensive experience in technology governance, quality systems, and institutional management, Shri Pandi has contributed to enhancing process maturity, compliance, and trust in large-scale ICT deployments. Under his leadership, STQC continues to support secure, interoperable, and high-quality digital solutions, reinforcing India's confidence in technology-enabled public services and industrial systems.

Guest of Honour:

Dr. Mohammad Rihan

Director General

National Institute of Solar Energy (NISE)



Dr. Mohammad Rihan is the Director General of the National Institute of Solar Energy (NISE), an autonomous institution under the Ministry of New and Renewable Energy (MNRE), Government of India, and a national center of excellence for solar energy research, development, testing, and training. He is a distinguished technologist and administrator with extensive experience in renewable energy systems, solar photovoltaics, and sustainable energy policy implementation.

Dr. Rihan has played a pivotal role in strengthening India's solar energy ecosystem through initiatives focused on technology innovation, quality assurance, capacity building, and international collaboration. Under his leadership, NISE has expanded its contributions in solar PV performance evaluation, standards and testing, grid integration, energy storage, and skill development, supporting national missions such as the National Solar Mission.

He has been actively involved in policy advisory roles, inter-institutional collaborations, and global renewable energy programs, representing India in international forums and technical working groups. Dr. Rihan regularly engages with academia, industry, and government stakeholders to promote research-driven, scalable, and sustainable solar solutions.

Recognized for his leadership in renewable energy advancement, Dr. Mohammad Rihan continues to contribute significantly to India's transition toward clean energy, energy security, and sustainable development.

Guest of Honour:

Prof. Sri Niwas Singh

Director

Atal Bihari Vajpayee–Indian Institute of Information Technology and Management (ABV-IIITM), Gwalior



Prof. Sri Niwas Singh is a distinguished academician, administrator, and globally renowned expert in Electrical Power Systems, currently serving as Director, ABV-IIITM Gwalior, on leave from his position as Professor (HAG), Department of Electrical Engineering, IIT Kanpur. He holds a Ph.D. in Electrical Engineering (Power Systems) from IIT Kanpur and has over three decades of experience spanning academia, industry, and institutional leadership.

His research interests include electricity markets and economics, HVDC and FACTS technologies, power system operation and control, renewable energy forecasting, smart grids, active distribution systems, power quality, and AI applications in power systems. Prof. Singh has authored over 500 research publications with more than 12,000 citations (h-index 57) and has guided 40 Ph.D. scholars. He is also the author/editor of multiple textbooks and edited volumes, and a contributor to widely acclaimed NPTEL courses.

Prof. Singh has held several prestigious leadership roles, including Vice-Chancellor of MMMUT Gorakhpur, Chairman of JEE (Advanced) 2016, and Immediate Past Chairman of IEEE India Council. A recipient of numerous national and international honors, he is a Fellow of IEEE (USA), INAE, IET (UK), and Alexander von Humboldt Foundation, and has received prestigious awards including the IEEE IAS Outstanding Educator Award and INAE Outstanding Teacher Award.

Guest of Honour:

Prof. Dinesh Prasad Saklani

Director

National Council of Educational Research and Training (NCERT)



Prof. Dinesh Prasad Saklani is the Director of the National Council of Educational Research and Training (NCERT), the premier national institution responsible for curriculum development, textbook preparation, teacher education, and academic support for school education in India. A distinguished educationist and academic leader, he has made sustained contributions to curriculum design, pedagogical innovation, educational research, and institutional governance.

With extensive experience in the field of education, Prof. Saklani has been closely involved in translating national educational priorities into practice, particularly in alignment with the National Education Policy (NEP) 2020. Under his leadership, NCERT has undertaken major initiatives in curriculum rationalization, competency-based learning, experiential pedagogy, and assessment reforms. He has also emphasized the integration of digital technologies, development of e-content, and promotion of inclusive and multilingual education to enhance learning outcomes across diverse learner groups.

Prof. Saklani has played a key role in strengthening teacher professional development through large-scale training programs, capacity-building initiatives, and academic guidance for schools and state education boards. His vision focuses on fostering critical thinking, creativity, values-based education, and future-ready skills among learners. Through his leadership at NCERT, he continues to contribute significantly to the transformation and modernization of India's school education ecosystem.

Guest of Honour:

Dr. Nagendra Prasad Singh, IAS (Retd.)

Karyavahak Adhyaksha
Bhartiya Siksha Board



Dr. Nagendra Prasad Singh, IAS (Retd.) is a distinguished retired Indian Administrative Service officer (Uttar Pradesh cadre, 2004 batch) and currently serves as Sadasya – Karyavahak Adhyaksha.

Over his illustrious career, he has held several key positions in both state and central governments, including Special Secretary (Rural Development, Uttar Pradesh), where he spearheaded programs aimed at community empowerment, tribal welfare, and inclusive socio-economic development. Known for his visionary leadership and innovative governance, Dr. Singh has implemented administrative reforms that have significantly improved transparency, efficiency, and accountability in government operations.

He has been actively involved in policy formulation, capacity building, and mentoring leadership programs, guiding numerous initiatives to strengthen governance frameworks at the state and national levels. His contributions extend to public sector advisory roles, development programs, and collaborative projects focused on social welfare, education, and rural development. Dr. Singh's approach emphasizes innovation, participatory governance, and sustainable development, earning him recognition for his transformative impact on communities and public administration.

Even in retirement, he continues to provide strategic guidance, participate in advisory and consultative committees, and mentor emerging leaders, reflecting his enduring commitment to national development, good governance, and inclusive growth.

Guest of Honour:

Ms. Shweta Khurana

Sr. Director APJ - Government Partnerships & Initiatives,
Global Government Affairs Group, Intel



Ms. Shweta spearheads strategic programs and initiatives with governments across Asia Pacific and Japan, focusing on public-private partnerships that advance AI human capital development. Her leadership supports Intel's global mission to empower 30 million people with AI skills, fostering inclusive technology adoption and preparing the workforce for current and future challenges.

With over 23 years of distinguished experience, Ms. Shweta has built trusted collaborations with governments, development agencies, academia, and communities worldwide. She has designed innovative programs addressing societal challenges, promoting youth empowerment, and transforming education through technology. Since joining Intel in 2010, she has led critical initiatives, including Corporate Affairs in Indonesia and K-12 technology-enabled education in India, creating multi-stakeholder alliances that drive sustainable impact.

Ms. Shweta is widely recognized for leveraging business for social good, fostering shared value, and enabling regulatory excellence. Beyond her professional accomplishments, she passionately explores the impact of emerging technologies on humanity and delights in crafting colloquial Shakespearean adaptations for Gen Z, reflecting her creativity, vision, and commitment to inspiring the next generation.

Guest of Honour:

Ms. Girija Mukund

CSR and Sustainability Specialist at Kyndryl



Ms. Girija Mukund is a CSR and Sustainability Specialist at Kyndryl, where she leads and supports initiatives focused on responsible business practices, environmental sustainability, and inclusive social impact. With strong expertise in corporate social responsibility (CSR), ESG frameworks, and sustainability strategy, she contributes to aligning organizational goals with long-term societal and environmental value creation.

At Kyndryl, Ms. Mukund works closely with global and regional stakeholders, NGOs, and community partners to design and implement high-impact CSR programs in areas such as digital inclusion, education, skill development, environmental stewardship, and community resilience. She plays a key role in impact assessment, compliance, reporting, and governance, ensuring transparency and effectiveness of sustainability initiatives.

She is actively involved in integrating sustainability principles into business operations, promoting responsible technology use and ethical practices. Known for her collaborative approach, she fosters cross-sector partnerships to scale impact and drive measurable outcomes aligned with the UN Sustainable Development Goals (SDGs).

A committed advocate of sustainable development and social innovation, Ms. Girija Mukund regularly engages with professional forums and community platforms. Her work continues to strengthen Kyndryl's contribution to responsible growth, stakeholder engagement, and positive societal transformation.

Guest of Honour:

Dr. (Ms.) Sandhya Chintala

Vice President, NASSCOM



Dr. (Ms.) Sandhya Chintala is the Executive Director of the IT-ITeS Sector Skills Council and Vice President of the National Association of Software and Service Companies (NASSCOM), India's premier industry body for the IT-BPM sector. With over 37 years of experience in education management, industry-academia collaboration, and talent development, she has been instrumental in shaping India's workforce for the digital economy. Dr. Chintala has played a pivotal role in designing and implementing national education and skills frameworks, developing occupational standards, and establishing quality assurance systems to bridge the gap between academia and industry needs.

Under her leadership, the IT-ITeS Sector Skills Council has successfully implemented workforce analytics, market intelligence systems, and online assessment platforms, supporting large-scale talent development initiatives. She has also contributed to curriculum modernization, teaching-learning innovation, and governance frameworks to align academic outcomes with industry requirements. Her efforts have strengthened India's position as a global destination for skilled IT and ITeS professionals. Dr. Chintala continues to mentor leaders, guide large-scale capacity-building programs, and foster collaborations that drive sustainable growth, innovation, and excellence in India's technology and education sectors.

Guest of Honour:

Sh. Keshri Kumar Asthana

Chief Technology Officer (CTO) - Government, Health & Education,
Microsoft India



Sh. Keshri Kumar Asthana is the Chief Technology Officer (CTO) for Government, Health, and Education at Microsoft India, where he provides strategic and technical leadership for large-scale digital transformation across the public sector. In this role, he helps institutions adopt modern cloud, data, and artificial intelligence platforms to modernize operations, strengthen digital public infrastructure, and deliver scalable, citizen-centric outcomes aligned with national priorities.

With over two and a half decades of experience across highly regulated domains including government, financial services, and telecommunications, Sh. Asthana brings deep expertise in software engineering, enterprise architecture, cloud computing, and AI-driven systems. He works in close collaboration with global and regional teams, government stakeholders, and ecosystem partners to design and implement secure, resilient, and future-ready technology architectures, ensuring that digital investments translate into sustained operational impact and long-term value. Throughout his professional journey, Sh. Asthana has played a pivotal role in shaping technology strategy and driving enterprise-scale modernization initiatives that enhance service delivery and institutional effectiveness. Beginning his career as a software engineer, he evolved into a hands-on architect and, over time, into a trusted technology leader. His career reflects a strong growth mindset—characterized by continuous learning, adaptability, and a commitment to embracing emerging technologies to solve complex, real-world challenges at scale.

Known for his collaborative and mentorship-driven leadership style, Sh. Asthana actively supports capability building and talent development, fostering high-performing teams that combine engineering rigor with innovation. He consistently champions the responsible and purposeful use of technology to enable transformation, resilience, and inclusion.

A respected thought leader, Sh. Asthana regularly engages with academic institutions, industry forums, and professional communities, sharing insights on cloud transformation, artificial intelligence adoption, cybersecurity, and emerging digital trends. He is also a published author, and his work on cloud architecture focuses on simplifying modernization journeys and enabling organizations to confidently adopt new technology paradigms.

Sh. Keshri Kumar Asthana is an alumnus of the National Institute of Electronics & Information Technology (NIELIT), and he remains closely aligned with its mission of advancing digital skills, fostering innovation, and building technology leadership for India's evolving digital ecosystem.

Guest of Honour:

Shri T. P. Singh

Former Executive Director, NIELIT



Shri T. P. Singh served as the Executive Director of the National Institute of Electronics and Information Technology (NIELIT) and is a senior professional with rich experience in electronics, information technology, e-governance, and human resource development. During his distinguished tenure at NIELIT, he played a key role in strengthening the institution's mandate in IT education, skill development, and capacity building, aligned with national digital initiatives.

He was actively involved in the planning, implementation, and monitoring of large-scale training programs, including industry-oriented certification courses, government-sponsored skill development schemes, and technology-enabled learning initiatives. Shri Singh contributed significantly to expanding NIELIT's outreach through academic collaborations, industry partnerships, and engagement with state and central government departments.

Known for his administrative acumen and people-centric leadership, he supported institutional growth through process optimization, quality assurance, and infrastructure development. His efforts helped enhance NIELIT's role as a premier organization in digital literacy, professional education, and emerging technology training.

Shri T. P. Singh's contributions continue to be valued for their lasting impact on technology-driven education and workforce readiness in India.

Keynote Speaker:

Dr. Sunil Vadera

Professor

University of Salford, United Kingdom



Dr. Sunil Vadera is a distinguished academic at the University of Salford, United Kingdom, with extensive experience in computer science, data analytics, and artificial intelligence. He has made significant contributions to teaching, research, and academic leadership, particularly in the areas of machine learning, data mining, decision support systems, and applied AI.

Dr. Vadera has been actively involved in curriculum development, research supervision, and international collaboration, contributing to the advancement of industry-relevant and research-led education. He has supervised numerous doctoral and postgraduate researchers and has published widely in reputed international journals and conferences.

With strong engagement in industry–academia partnerships, he has worked on applied research and consultancy projects addressing real-world challenges across sectors. Dr. Vadera regularly participates in international conferences, expert panels, and academic forums, delivering invited talks and contributing to scholarly discourse.

Recognized for his academic excellence, mentorship, and global outlook, Dr. Sunil Vadera continues to play an important role in advancing research, innovation, and international cooperation in computing and data-driven technologies.

Keynote Speaker:

Dr. Vasileios Paliktzoglou

Associate Professor
Bahrain Polytechnic



Dr. Vasileios Paliktzoglou, an academic and industry professional, holds a Ph.D. in Computer Science from the University of Eastern Finland. He is an active contributor to academia, serving as a guest and associate editor for prestigious journals like the Journal of Information Systems Education (JISE) and IAFOR Journal of Education. He has been a keynote speaker at several academic and industry events, sharing his insights on social computing, collaborative learning, and emerging technologies in higher education.

Dr. Paliktzoglou also actively participates in international research projects, highlighting his commitment to advancing knowledge and innovation as the Book Series Editor for the “Emerging Technologies in Education” at Vernon Press and “AI and Education” at STAR Scholars Press. His expertise continues to shape the academic and research landscape at Bahrain Polytechnic. Dr. Vasileios Paliktzoglou is a distinguished academic at Bahrain Polytechnic, with strong expertise in computer science, educational technology, and applied digital innovation. He is actively engaged in teaching, research, and curriculum development, contributing to the advancement of practice-oriented and technology-driven higher education.

Dr. Paliktzoglou actively participates in international academic forums, conferences, and review panels, and engages with industry and academic partners to promote applied research and global collaboration. He is widely respected for his commitment to educational innovation, research excellence, and international engagement.

Keynote Speaker:

Dr. Ashish Seth

Professor

Inha University, S. Korea



Dr. Ashish Seth is an author, researcher, teacher and a consultant. He has been into academics for more than 17 years and have an exposure of working at various roles and responsibilities.

He has published research papers in reputed journals like ACM, ISTE, WSEAS, Inderscience, IEEE, Springer, etc. He is a senior member of IEEE and an active member of an International societies like ACM, CSI, IACSIT, IAENG, etc. He holds Technical Review committee and Editorial Review Board for many national and International Journals of Computer Science. He has been participating and organizing seminar, conferences, workshops, expert lecturers, technical events to share knowledge among academicians, researchers and to promote opportunities for new researchers. He is also an ACM distinguished speaker and has delivered many lectures and provided training programs for students and faculties on various areas of computer science. His interest includes information systems, data science, soft computing, cloud computing and blockchain technologies.

Keynote Speaker:

Dr. Vinaytosh Mishra

Associate Professor

Gulf Medical University, UAE



Dr. Vinaytosh Mishra is Associate Professor for (Management, Digital Health, and Health Analytics) at the Thumbay College of Management and AI in Healthcare, Gulf Medical University, Ajman (UAE). He has more than 18 years of experience in industries like Healthcare, EdTech, Finance, and Information Technology. He was instrumental in making a diabetes specialty clinic into a Two-fifty-bed multi-specialty clinic during his tenure at Aaroha Healthcare (P) Ltd. In his last Assignment as Associate Professor at FORE School of Management, New Delhi he was program director for two successful long-duration programs namely “Building Intelligent Healthcare Analytics” and “PGPM in Healthcare Management and Analytics”. He is also a certified Diabetes Educator and Master Black Belt in Lean Six Sigma.

Dr. Mishra is certified by the Massachusetts Institute of Technology, USA in System Thinking. He is also holding advanced certification in System Dynamics Modeling from ATC-INNOVA, Spain. He is also a certified supply chain management expert (Micro Master from Massachusetts Institute of Technology, USA) and has a special interest in healthcare supply chains.

Dr. Vinaytosh Mishra has published journals of international repute (ABDC/Scopus/SSCI) and served as a reviewer for various international journals. Dr. Mishra is also part of the editorial board of leading journals such as Health Policy and Technology, Review of Management Literatures, Hospital Topics, and Frontiers in Digital Health.

He features regularly on 100.3 FM Talk Business and Sport Show as a Business Strategy and Technology Expert and is an invited columnist for Asia Development Bank Asia Pathway, Times of India, The Brew News, UAE.

Speaker:

Sh. Sivakumar P. R.

Founder and CEO of Maven Silicon, Bengaluru



Sh. Sivakumar P. R. is the Founder and Chief Executive Officer of Maven Silicon, Bengaluru, a leading provider of VLSI and semiconductor design services and advanced industry-oriented training. With more than two decades of experience in the global semiconductor industry, he has played a pivotal role in bridging the gap between academia and industry by creating a strong ecosystem for skill development in VLSI, SoC design, verification, embedded systems, and emerging semiconductor technologies.

Prior to founding Maven Silicon, Sh. Sivakumar held senior technical and leadership positions in reputed multinational semiconductor companies, where he contributed to the design and deployment of complex SoC and ASIC solutions for high-performance and low-power applications. Under his visionary leadership, Maven Silicon has partnered with IITs, NITs, universities, and global semiconductor firms, enabling large-scale capacity building aligned with India's semiconductor and chip design mission.

He has been instrumental in shaping industry-relevant curricula, hands-on laboratories, and faculty development programs, significantly enhancing employability of engineering graduates. Sh. Sivakumar is a sought-after speaker, mentor, and industry advisor, actively contributing to national forums on electronics system design and manufacturing (ESDM).

In recognition of his contributions to VLSI education, industry skilling, and entrepreneurship, he has received multiple leadership and excellence awards from academic, industry, and professional bodies. His work continues to strengthen India's semiconductor talent pipeline and innovation ecosystem.

Speaker:

Sh. Parthasarathy

Senior Director –Design for Testability (DFT)
Intel India Pvt. Ltd.



Sh. Parthasarathy serves as Senior Director – Design for Testability (DFT) at Intel India Pvt. Ltd., providing distinguished strategic and technical leadership in the development of advanced DFT architectures and test methodologies for state-of-the-art semiconductor products. With over two decades of exemplary industry experience, he has played a pivotal role in delivering high-quality, high-yield silicon across multiple technology nodes and complex System-on-Chip (SoC) platforms.

At Intel, he has led large, globally distributed cross-functional teams, driving initiatives in DFT strategy, silicon debug, test coverage enhancement, reliability, and manufacturability for high-performance processors and SoC designs. His expertise spans scan and BIST architectures, boundary scan, diagnosis, failure analysis, and post-silicon validation, significantly contributing to accelerated time-to-market and superior product robustness.

Sh. Parthasarathy has been instrumental in advancing innovation in test automation and design-for-manufacturing practices, effectively addressing challenges in advanced process technologies and heterogeneous integration. Renowned for his mentorship and people leadership, he has consistently nurtured high-impact engineering teams.

In recognition of his outstanding technical leadership and sustained contributions, he has received multiple excellence and leadership accolades at Intel. A respected industry thought leader, he actively engages with academia and professional forums, strengthening the global semiconductor testing ecosystem and India's role in advanced chip design.

Speaker:

Dr. Kishore-P. Sarawadekar

Associate Professor, IIT BHU



Dr. Kishore-P. Sarawadekar is an Associate Professor in the Department of Electronics Engineering at the Indian Institute of Technology (BHU), Varanasi. He earned his Ph.D. in Electronics and Electrical Communication Engineering from the Indian Institute of Technology Kharagpur in 2012, with a dissertation on VLSI-based performance enhancement of image processing units for ultrasound systems. He completed his M.Tech. from IIT Kharagpur in 2007 with specialization in VLSI Design and Microelectronics Engineering, and his B.Tech. in Electronics Engineering from Shivaji University, Kolhapur, in 1996.

Dr. Sarawadekar has rich industrial, academic, and research experience in VLSI architectures, digital and embedded system design, hardware accelerators, FPGA/ASIC implementations, and image and signal processing, particularly for medical and real-time applications. His work emphasizes low-power, high-performance design methodologies and optimization of computation-intensive systems.

He has published research papers in reputed international journals and conferences and actively guides undergraduate, postgraduate, and doctoral students. He has been involved in curriculum development, laboratory establishment, and collaborative research initiatives. In recognition of his academic excellence and research contributions, Dr. Sarawadekar has received institutional and academic awards and commendations. Through his teaching, research, and mentorship, he continues to contribute significantly to electronics engineering education and indigenous technology development in India.

Speaker:

Sh. Sumeet Verma

Strategic Leader at Arm



Sh. Sumeet Verma is a Strategic Leader at Arm, where he plays a key role in shaping technology strategy, ecosystem partnerships, and business transformation initiatives aligned with Arm's global vision for scalable, energy-efficient computing. With extensive experience across the semiconductor, IP, and computing ecosystems, he has been instrumental in driving strategic engagements that accelerate innovation, adoption, and market expansion.

At Arm, Sh. Verma works closely with global technology leaders, system designers, and industry partners, contributing to roadmap alignment, platform strategy, and ecosystem enablement across domains such as SoC design, embedded systems, AI at the edge, automotive, and data infrastructure. His work supports the translation of cutting-edge research and IP innovation into real-world, high-impact solutions.

A strong advocate of industry-academia collaboration, he actively engages with universities, startups, and policy stakeholders to strengthen talent development, skilling, and technology readiness, particularly in emerging markets. He is a frequent participant in strategic forums, panels, and technical dialogues, offering insights on the future of computing, semiconductor value chains, and digital transformation.

Recognized for his strategic acumen, collaborative leadership, and ecosystem-building approach, Sh. Sumeet Verma continues to contribute significantly to advancing Arm's leadership in the global semiconductor landscape and fostering a resilient, innovation-driven technology ecosystem.

Speaker:

Mr. Diljith M

Chief Technology Officer (CTO)
Avench Systems Pvt. Ltd., Bengaluru



Mr. Diljith Maviladeth is the Chief Technology Officer at Avench Systems Pvt. Ltd., Bengaluru, where he leads the organization's technology vision and innovation strategy. With extensive experience across hardware platforms, embedded systems, and hardware–software co-design, he has played a pivotal role in architecting and delivering high-performance, mission-critical systems that meet stringent functional safety and cybersecurity standards for defence, industrial, and oil & gas sectors.

As CTO, Mr. Diljith oversees product engineering, solution Architecting and R&D initiatives, ensuring seamless alignment between business objectives and domain-driven, standards-compliant engineering practices. He is instrumental in driving the adoption of modern embedded architectures, system validation methodologies, and performance-optimized designs, enabling robust and future-ready products.

Recognized for his hands-on technical leadership and mentoring approach, he actively guides engineering teams in hardware design best practices and systems engineering, while fostering a culture of innovation and engineering excellence. His continued contributions significantly strengthen Avench Systems' capabilities in building reliable solutions and advancing technology-led growth across embedded and system-level domains.

Speaker:

Dr. Mariagrazia Squicciarini

Chief of Executive Office

Social and Human Sciences Sector, UNESCO



Dr. Mariagrazia Squicciarini is the Chief of the Executive Office of the Social and Human Science (SHS) Sector, UNESCO, where she provides strategic leadership in shaping global AI policy frameworks grounded in ethics, human rights, and inclusive development. She plays a central role in advancing UNESCO's mission to ensure that artificial intelligence serves humanity, promotes social good, and reduces inequalities across nations and communities.

Dr. Squicciarini has been closely associated with the development, adoption and implementation of UNESCO's landmark Recommendation on the Ethics of Artificial Intelligence, supporting Member States in translating ethical principles into actionable governance, capacity-building, and policy instruments. Her work and research background span critical areas including AI governance, digital transformation, jobs and skills in the digital transformation, innovation ecosystems, and the socio-economic impacts of emerging technologies.

With extensive experience at the intersection of technology, economics, and public policy, she has led and contributed to numerous international research initiatives, multilateral dialogues, and high-level advisory processes involving governments, academia, industry, and civil society. She regularly represents UNESCO at global forums, ministerial meetings, and expert panels, advocating responsible, transparent, and inclusive AI systems.

Recognized internationally for her thought leadership and policy expertise, Dr. Squicciarini continues to guide global efforts toward building AI ecosystems that align technological progress with human rights, sustainable development, and societal welfare and well-being.

Speaker:

Major General R. Putarjunam (Retd.)

Chief Executive Officer of SkillsDA Cybersecurity



Major General R. Putarjunam (Retd.) is the Chief Executive Officer of SkillsDA Cybersecurity, where he provides strategic leadership in advancing cybersecurity skilling, capacity building, and workforce readiness aligned with national and global security requirements. With a distinguished career in the Indian Army, he brings decades of experience in defence leadership, cyber operations, information security, and strategic planning.

During his military service, Major General Putarjunam held several key command, staff, and leadership appointments, contributing significantly to operational readiness, technology-driven defence initiatives, and cyber and information warfare capabilities. His experience spans secure communications, cyber resilience, risk management, and defence technology integration, making him a respected authority in national security and cybersecurity domains.

In his current role at SkillsDA Cybersecurity, he has been instrumental in designing and implementing industry-relevant cybersecurity training, certification pathways, and large-scale skilling programs for students, professionals, and government stakeholders. He actively promotes industry-academia-government collaboration to address the growing demand for skilled cybersecurity professionals.

A sought-after speaker and mentor, Major General Putarjunam regularly engages with professional forums, academic institutions, and policy platforms. His leadership continues to strengthen cyber awareness, digital trust, and talent development, contributing meaningfully to India's evolving cybersecurity ecosystem.

Throughout his career, he has demonstrated a strong ability to lead teams, manage projects, and drive innovation in both client-facing and internal functions, making him a seasoned leader in advanced analytics and consulting.

Speaker:

Dr. Mahesh Kumar H. Kolekar

Associate Professor, IIT Patna



Dr. Mahesh Kumar H. Kolekar is an Associate Professor at the Indian Institute of Technology (IIT) Patna, where he is actively engaged in teaching, research, and academic leadership in the areas of signal processing, machine learning, and intelligent systems. With a strong academic background and significant research experience, he has made notable contributions to advanced algorithms and applications in image and video processing.

Dr. Kolekar's research interests encompass digital signal processing, pattern recognition, computer vision, deep learning, biomedical signal and image analysis, and affective computing. His work addresses both theoretical advancements and practical applications, with outcomes relevant to healthcare, human-computer interaction, and intelligent sensing systems. He has published extensively in high-impact international journals and reputed conferences, and his research has received wide recognition within the academic community.

At IIT Patna, he has been actively involved in curriculum development, student mentoring, and research supervision, guiding postgraduate and doctoral scholars. He has also served in various institutional committees and contributed to the strengthening of research culture and interdisciplinary collaboration.

Dr. Kolekar is a recipient of several academic recognitions and research grants from national funding agencies. A committed educator and researcher, he continues to contribute significantly to the advancement of signal processing and AI-driven technologies through research, teaching, and professional service.

Speaker:

Sh. Deepanshu Anand

Regional Head Talent Aquisition Ops- Sweden and EMEA (Europe, Middle East & Africa), Ericsson India



The Global Vanguard of TA Operations With over two decades of experience in the HR trenches, Deepanshu Anand stands at the intersection of global scale and local impact. Currently serving as the Regional Head of Talent Acquisition Operations, Deepanshu orchestrates complex HR ecosystems across 78 countries, spanning Sweden, EMEA, and beyond. His journey is defined by a rapid ascent—scaling leadership from a team of 24 to over 50 professionals—managing the lifecycle of talent across diverse cultural and regulatory landscapes.

Bridging the "Campus-to-Corporate" Divide Deepanshu's influence extends far beyond the boardroom. As a dedicated Academia Consultant, he recognizes a critical friction point in the modern economy: the knowledge gap between university curricula and industry demands. Through his counseling and workshops, he empowers the next generation of Indian professionals with "day-zero" readiness, focusing on:

ATS-Optimized Personal Branding: Navigating the digital gatekeepers of modern hiring. Professional Maturity: Transitioning from a student mindset to an ownership-driven corporate identity. Strategic Networking: Leveraging platforms like LinkedIn to create opportunities rather than just seeking them.

The AI Enthusiast with a Human Touch In an era of rapid automation, Deepanshu is a vocal advocate for the ethical and strategic integration of Artificial Intelligence in HR. He doesn't just view AI as a tool for efficiency, but as a catalyst for deeper human connection. By automating the mundane, he believes HR leaders can return to their core mission: being the "human" in Human Resources.

A Commitment to India's Growth A frequent face at HR Roundtables and National Conclaves, Deepanshu is deeply invested in the collective growth of the Indian professional community. His philosophy is rooted in "Paying it Forward." By sharing global best practices and insights gained from international markets, he aims to elevate India's workforce to meet global standards, ensuring that the country's demographic dividend is realized through skill-building and mentorship.

"Success in HR isn't just about filling seats; it's about building bridges—between technology and talent, and between where a professional is today and where the global market needs them to be tomorrow."

Speaker:

Shri Arun K. Choudhary

Scientist 'C' & Deputy Director
Ministry of New and Renewable Energy (MNRE),



Shri Arun K. Choudhary is a Scientist 'C' and Deputy Director at the Ministry of New and Renewable Energy (MNRE), Government of India, where he is engaged in the formulation, implementation, and monitoring of national programs in renewable energy and sustainable technologies. With a strong technical background, he contributes to policy planning, project appraisal, and deployment of solar, wind, bioenergy, and emerging clean energy solutions aligned with India's energy transition goals.

At MNRE, Shri Choudhary has been associated with initiatives supporting research and development, technology demonstration, capacity building, and industry collaboration in the renewable energy sector. His work includes coordination with state governments, public sector undertakings, research institutions, and private stakeholders to facilitate effective implementation of renewable energy schemes and standards.

Known for his technical rigor and administrative competence, he plays a key role in advancing innovation-driven, sustainable, and self-reliant energy ecosystems. His contributions support India's commitments towards energy security, climate action, and large-scale adoption of clean and renewable energy technologies.

Speaker:

Sh. Rakshit Tandon

International Cyber Expert



Sh. Rakshit Tandon is a renowned International Cyber Expert, widely recognized for his contributions to cybersecurity, cybercrime prevention, and digital safety at national and global levels. With extensive experience in cyber forensics, cyber law, online safety, and threat intelligence, he has been actively involved in addressing complex cyber threats affecting individuals, organizations, and governments.

He has worked closely with law enforcement agencies, government bodies, judiciary, educational institutions, and international organizations, providing expert guidance on cyber investigations, policy frameworks, and capacity building. Sh. Tandon has played a significant role in cyber awareness campaigns, training programs, and advisory initiatives, particularly in areas of child online safety, financial cybercrime, social media security, and emerging digital risks.

A sought-after speaker and trainer, he has delivered keynote addresses, expert lectures, and workshops across India and abroad, contributing to global discourse on responsible and secure cyberspace. He frequently engages with media and professional platforms to demystify cybersecurity issues for wider audiences.

Recognized for his practical expertise, advocacy, and sustained impact, Sh. Rakshit Tandon continues to work towards building a safer, resilient, and trusted digital ecosystem worldwide.

Speaker:

Major Vineet Kumar

Founder and President of the CyberPeace Foundation



Major Vineet Kumar is a globally recognized leader in cyber diplomacy and Cyber peacebuilding, who has redefined cybersecurity as a force for social good. As Founder and Global President of CyberPeace, he has spent nearly three decades building one of the world's largest citizen-driven movements for online safety, inclusion, and resilience — impacting over 200 million people across 112 countries.

An alumnus of Cranfield University and the University of Cambridge, Vineet is also a Chevening Fellow (UK Government), an alumnus of the U.S. Department of State's International Visitor Leadership Program (IVLP), and part of the British Council Future Leaders 2017 Programme. Major Vineet leads global collaborations with the United Nations, G20, Commonwealth Secretariat, ITU, Google, Meta, Amazon, and others, shaping global norms on AI safety, Cybersecurity, and digital trust. He has trained diplomats from 100+ countries, authored multiple acclaimed books, published several IEEE papers, and holds multiple patents in cybersecurity and AI Safety.

Recipient of 13 international and 25 national awards, including the recent Entrepreneur Magazine's Social Entrepreneur of the Year 2025, Times of India Social Entrepreneur of the Year 2025, and Government of India's highest youth honour, the National Youth Award (Government of India), Major Vineet embodies the mission of using technology to empower people, strengthen peace, and build a trusted digital future for humanity.

He has been a distinguished speaker at leading global forums such as the UN Security Council CTC, UN IGF, ITU WSIS, Global Cybersecurity Forum, UN Cybercrime Convention, United Nations General Assembly (UNGA) 2025, St Petersburg International Economic Forum (SPIEEF) 2025, Valdai Club Annual Forum to name a few.

Speaker:

Mr. Prince Komal Boonlia

Director and Promoter

Straightarc Technologies Private Limited



Mr. Prince Komal Boonlia is director and promoter associated with Straightarc, An accomplished entrepreneur and leading cybersecurity consultant, Mr. [Name] brings over 22 years of proven expertise in executing complex turnkey IT and cybersecurity projects spanning a wide spectrum of advanced technologies. His professional journey includes engagements with top multinational corporations, classified intelligence agencies, premier educational institutions, and national law enforcement organizations, reflecting the depth and trust associated with his work.

Beginning his entrepreneurial journey in 1995, he founded Synergy Systems, an organization that earned a reputation for delivering technically challenging projects, many of which had eluded larger industry players. In 2008, he expanded his vision into information security training, delivering specialized programs for prestigious organizations including Reliance DAKC, IMT Ghaziabad, IIM Udaipur, CBI Academy, CRPF Training Institutions, Royal Oman Police, and other international bodies.

As the Founder, Director, and CEO of StraightArc Technologies, he has led the development of several first-of-their-kind indigenous cybersecurity platforms, including India's first Cyber Range for IT and OT environments, Breach Attack and Traffic Generators, SOC solutions, Remote DFIR platforms, Table-Top Exercise (TTX) platforms, and DDoS testing systems. He has also actively contributed to recent cyber operations of national significance.

A noted author, he published "*System Forensics*" (ISBN: 9788125931515), India's first book on the subject, co-authored with the Brand Ambassador of Digital India, and continues to contribute through research papers, seminars, conferences, and workshops.

Speaker:

Dr. Rajiv Misra

IIT, Patna



Dr Rajiv Misra is a professor and head of the Department of Computer Science and Engineering at the Indian Institute of Technology Patna, India. He obtained his PhD degree from IIT Kharagpur, M.Tech degree in Computer Science and Engineering from the Indian Institute of Technology (IIT) Bombay, and Bachelor of Engineering degree in Computer Science from MNIT Allahabad.

His research interests spanned the design of distributed algorithms for Mobile, Adhoc and Sensor Networks, Cloud Computing and Wireless Networks. He has contributed significantly to these areas and published more than 70 papers in high-quality journals and conferences, and 2 book chapters.

His h-index is 10 with more than 590 citations. He has authored papers in IEEE Transactions on Mobile Computing, IEEE Transactions on Parallel and Distributed Systems, IEEE Systems Journal, Adhoc Networks, Computer Networks, and Journal of Parallel and Distributed Computing. He has edited a book titled “Smart Techniques for a Smarter Planet: Towards Smarter Algorithms” for the "Studies in Fuzziness and Soft Computing" book series, Springer (2018).

He has supervised four PhD students and currently has four Phd students working under his supervision in the area of big data, cloud computing, distributed computing, and sensor networks. He is a senior member of the IEEE and a fellow of IETE. He has completed as the Principal Investigator of an R&D Project sponsored by DeITY entitled “Vehicular Sensor and Mesh Networks-based Future ITS”. He has mentored the online courses on Cloud Computing, Advanced Graph Theory and Distributed Systems in the platform of NPTEL.

Speaker:

Prof. Abhirup Datta

Professor ,Indian Institute of Technology (IIT) Indore



Prof. Abhirup Datta is a Professor at the Department of Astronomy, Astrophysics and Space Engineering (DAASE), IIT Indore, and currently serves as the Dean of Research and Development of the Institute. His research expertise spans observational cosmology, with a particular focus on the Dark Ages, Cosmic Dawn, and Epoch of Reionization using HI 21-cm cosmology. His work also encompasses radio interferometry—including calibration, imaging, and data analysis—along with ionospheric science and space weather studies using GNSS, NaVIC, and low-frequency radio techniques.

Prof. Datta actively integrates machine learning, astrostatistics, and multi-wavelength astronomy, including deep-field radio and X-ray observations of galaxy clusters. He has played a significant role in major international collaborations, most notably the Square Kilometre Array (SKA), serving as Co-Chair of the CD/EoR SKA Science Working Group (2019–2024) and as a Board Member of the SKA CD/EoR Science Team.

At IIT Indore, Prof. Datta has been instrumental in founding the DAASE department and developing key academic programs such as M.Sc. (Astronomy), M.S. (Space Sciences and Engineering), and M.Tech. (Space Engineering). He has also led major institutional collaborations with organizations including ISRO-SAC and MPCST, and has organized several international conferences and workshops, contributing significantly to India's space science and astrophysics ecosystem.

Speaker:

Ms. Guncha Malik

STSM (Senior Technical Staff Member)
IBM



Ms. Guncha Malik is a Senior Technical Staff Member (STSM) at IBM, recognized for her technical excellence, innovation leadership, and deep expertise in enterprise technologies and emerging computing paradigms. In her role, she drives the advancement of cutting-edge solutions across cloud security, SaaS, and on-premises software security, integrating artificial intelligence to strengthen enterprise resilience and threat defense.

At IBM, Ms. Malik provides technical leadership for complex, large-scale programs, collaborating with global teams to deliver high-impact, scalable, and security-hardened solutions for enterprise and mission-critical applications, ensuring end-to-end protection.

Beyond her core responsibilities, Ms. Malik is an IBM Quantum Ambassador and a Qiskit Advocate, actively engaging with customers, academia, and industry forums to accelerate quantum computing adoption. She mentors professionals and students, fosters community growth, and contributes to building a robust quantum ecosystem through knowledge sharing and advocacy. Her efforts help organizations explore quantum's transformative potential for solving complex computational challenges.

Through her combined expertise in cybersecurity and quantum computing, Ms. Malik continues to shape technical direction, mentor innovation, and strengthen IBM's leadership in advanced computing technologies.

Speaker:

Shri P. Soundararajan

Scientist 'E'

Centre for Development of Advanced Computing (C-DAC),
Bengaluru



Shri P. Soundararajan is a Scientist 'E' at the Centre for Development of Advanced Computing (C-DAC), Bengaluru, where he is actively engaged in the research, development, and deployment of advanced computing and digital technologies.

At C-DAC, Shri Soundararajan has been involved in the design and implementation of indigenous technology solutions supporting national missions in electronics, information technology, and digital transformation. He was a key member of the team involved in setting up the PARAM Padma supercomputer and has since been closely associated with the development of India's PARAM series of supercomputers, contributing significantly to the nationwide National Supercomputing Mission (NSM) ecosystem. Notably, he is one of the core team members responsible for setting up India's highest supercomputing system at C-DAC, Bengaluru.

He has played a key role in collaborative projects with government agencies, academia, and industry, contributing to technology transfer and capacity building. Known for his technical rigor and commitment to innovation, he has also been actively associated with training and mentoring programs aimed at developing skilled manpower in advanced computing domains. Under his supervision and through comprehensive HPC benchmarking activities, C-DAC publishes TopSC.in, which lists the Top Supercomputers of India in the January and July editions each year.

Shri P. Soundararajan's contributions reflect C-DAC's mission of achieving self-reliance in advanced computing technologies and strengthening India's digital and technological ecosystem through research-driven solutions and national service.

Speaker:

Prof. Vir Bahadur Singh

Professor

Director, Training & Placement

Jawaharlal Nehru University (JNU), New Delhi



Prof. Vir Bahadur Singh is a distinguished Professor at Jawaharlal Nehru University (JNU) and currently serves as the Director, Training & Placement, where he plays a pivotal role in strengthening industry-academia linkages and student career development. With a strong academic foundation and extensive experience in higher education, he has contributed significantly to teaching, research, and institutional leadership at one of India's premier universities.

As Director (Training & Placement), Prof. Singh has been instrumental in strategizing and expanding placement initiatives, fostering collaborations with leading national and multinational organizations, and enhancing employability and professional preparedness of students across diverse disciplines. His efforts focus on aligning academic learning with industry expectations, promoting internships, skill-oriented training, and exposure to emerging professional domains.

Prof. Singh is known for his student-centric approach, mentorship, and commitment to holistic development, encouraging students to pursue excellence in both academic and professional pursuits. He actively engages with industry leaders, recruiters, alumni, and academic stakeholders to create sustainable opportunities for students and graduates of JNU.

Through his leadership in training and placement activities, Prof. Vir Bahadur Singh continues to contribute meaningfully to capacity building, talent development, and the creation of future-ready human resources for the nation.

Speaker:

Dr. Rishikesh Patankar

Vice President (VP)

National Skill Development Corporation (NSDC)



Dr. Rishikesh Patankar is a seasoned professional with over 25 years of experience in Information and Communication Technology, specializing in e-Governance, research and development, and capacity building. He holds three Master's degrees and a Ph.D. in Computer Science, reflecting a strong academic foundation that complements his extensive professional expertise.

Throughout his career, Dr. Patankar has led the implementation of some of the world's largest digital, financial, and legal literacy initiatives, significantly impacting governance and skill development in India. He has held key positions with the Indian Navy, Digital India Corporation, and CSC SPV, and has also served internationally as a Software Expert in China, contributing to cross-border technology and capacity-building projects.

Currently, he leads Skilling Initiatives at NSDC, driving programs that align workforce development with industry requirements and emerging technologies. His work emphasizes outcome-based skilling, employability enhancement, and the integration of digital and technology-enabled training platforms.

In addition to his professional achievements, Dr. Patankar is an endurance sports enthusiast, actively pursuing cycling, swimming, and running, and has completed multiple IronMan events, demonstrating his commitment to discipline, resilience, and peak performance.

Speaker:

Shri Vikram Kamath

APJ Training Delivery Manager
Zscaler



Vikram Kamat is the APJ Training Delivery Manager at Zscaler, a global leader in cloud security solutions known for pioneering the zero-trust architecture and enabling organizations to securely transform their digital operations. Zscaler's platform protects thousands of enterprises by safeguarding users, applications, and data—regardless of location—through cloud-delivered, scalable security services.

Bringing years of multifaceted cybersecurity experience, Vikram leads enablement programs designed to strengthen security knowledge and capabilities across the Asia Pacific and Japan region.

Vikram's career has spanned diverse roles, including technical support, presales engineering, and enterprise training, allowing him to bridge technical expertise with strategic business outcomes.

Vikram's background covers a range of critical security domains such as Vulnerability Management, Attack Surface Management, Application Security, Compliance frameworks, and Endpoint Security solutions. Throughout his journey, Vikram has successfully delivered initiatives that demystify complex cybersecurity challenges, foster collaboration across teams, and empower stakeholders with practical guidance.

Widely recognized for building high-performing teams and enabling effective cross-functional partnerships, Vikram is passionate about advancing organizational and industry-wide security maturity.

Vikram's holistic perspective and commitment to education continue to drive secure digital transformation and operational excellence for enterprise customers and partners.

Speaker:

Sh. B. M. Tiwari

Assistant Director

All India Council for Technical Education (AICTE)



Sh. B. M. Tiwari is an Assistant Director at the All India Council for Technical Education (AICTE), where he contributes to the formulation, implementation, and monitoring of policies and regulatory frameworks for technical education in India. With substantial experience in academic administration and governance, he plays an important role in strengthening quality assurance, accreditation, and institutional compliance across engineering and management institutions.

At AICTE, Sh. Tiwari is actively involved in initiatives related to curriculum development, faculty development programs, student-centric reforms, and digital education platforms, aligned with national priorities such as NEP 2020, skill development, and innovation-driven learning. His work supports the enhancement of academic standards and outcome-based education in technical institutions nationwide.

He collaborates closely with universities, autonomous institutions, government bodies, and industry stakeholders to facilitate effective implementation of AICTE schemes and reforms. Known for his administrative acumen and commitment to educational quality, Sh. Tiwari also engages in capacity-building and awareness programs for faculty and institutional leaders.

Through his contributions at AICTE, Sh. B. M. Tiwari continues to support the advancement of accessible, relevant, and high-quality technical education in India.

Speaker:

Professor Debnath Pal

Indian Institute of Science, Bengaluru



Prof. Debnath Pal is a Professor of Computational Biology in the Department of Computational and Data Sciences at the Indian Institute of Science (IISc), Bengaluru. His research group works at the interface of biology, data science, and computation, with core interests spanning multi-scale biology and health.

His research group focuses on designing and applying computational frameworks that leverage data generated from advanced experimental platforms, including next generation sequencing, mass spectrometry, X-ray crystallography, nuclear magnetic resonance spectroscopy, and medical imaging modalities. Prof. Pal's recent research projects encompass diverse areas such as inference of protein function from molecular dynamics simulations, secondary and tertiary analysis of genomes, mechanisms of prokaryotic intrinsic transcription termination, and multi-species inter-organ transport.

A key thrust of his latest work is the generation of the MIDAS platform, aimed at creating robust, scalable, and interoperable medical data infrastructure. Through MIDAS, Prof. Pal's group is actively developing high-quality, curated medical imaging datasets and end-to-end computational solutions for imaging-based analysis, with applications in diagnosis, prognosis, and clinical decision support. This effort complements his leadership of an Indian Council of Medical Research (ICMR) national initiative focused on building gold-standard medical datasets and enabling data-driven healthcare research in India.

Prof. Pal serves as a reviewer for numerous national and international journals and has made significant contributions to protein structure analysis, protein–ligand and protein–protein interactions, and computational methods for genome-wide functional annotation. His work has been recognized with prestigious honors including the INSA Young Scientist Medal and the NASI–SCOPUS Young Scientist Award. Through an integrative, multi-scale approach that combines computational modelling, experimental data, and clinical datasets, his group develops innovative computational tools to advance biological research, medical imaging analytics, and drug discovery.

Speaker:

Dr. Rahila Sardar

PhD (Co-Founder & CEO)

Vgenomics India Pvt. Ltd



Dr. Rahila Sardar is the co-founder and CEO of Vgenomics, a biotech company solving diagnostics and therapeutic challenges for rare disease patients. A visionary scientist and biotech entrepreneur, Dr. Sardar is driven by a deep rooted mission to accelerate genetic diagnosis and therapeutic discovery. With over a decade of experience in genomics, systems biology, and AI integrated pipelines, she brings a rare blend of scientific rigor and strategic foresight to lead Vgenomics, an emerging leader in precision medicine across India and the MENA region.

She holds a PhD in Bioinformatics and Genomics from ICGEB and remains committed to ensuring that no family endures prolonged uncertainty. She previously held a position of Senior Research Fellow at the Indian Council of Medical Research (ICMR), where she worked on identifying novel drug targets for malaria. She also contributed to immunotherapeutic research at Alladapt, USA, where she worked on cross reactive peptides from food allergens. Her research includes significant contributions to tuberculosis drug resistance and several SARS CoV 2 studies focusing on host virus interactions, biomarker discovery, and therapeutic target identification.

Alongside her scientific contributions, Dr. Sardar continues to play an active role in strengthening the ecosystem for translational genomics. She joined as a Panel Expert at the Centre for Precision Medicine and Pharmacy at DPSRU (Delhi Pharmaceutical Sciences and Research University), supporting academic and clinical translation in genomics. She was also nominated to the advisory board of Healing Wings Foundation, a global consulting organization focused on rare disease and orphan drug commercialization

Speaker:

Dr. Avinash Mishra

Chief Executive Officer & Director
Growdea Technologies



Dr. Avinash Mishra is a pioneering researcher and entrepreneur in computational biology and drug discovery. He holds a Ph.D. from the Indian Institute of Technology Delhi (IITD), specializing in protein structure prediction, and has contributed to the R&D wing of AstraZeneca, gaining hands-on experience in pharmaceutical research.

Dr. Mishra was awarded the prestigious Indo-Australian Gold Fellowship, enabling a two-year postdoctoral research tenure at Griffith University, Australia, and further establishing his expertise in computational biology. His entrepreneurial journey includes founding a startup recognized with the Biotechnology Ignition Grant (BIRAC, India), the Newton Innovator Award (London), Leave a Nest Award (Japan), and the Power of Ideas Award (DST, India).

At Growdea Technologies, he leads a team developing AI- and machine learning-driven in-silico drug discovery platforms, empowering experimental biologists and accelerating the identification of novel therapeutics. He has authored numerous publications, and his innovative work includes a granted Indian patent on polypeptide sequences and compositions.

Dr. Mishra's contributions exemplify the integration of computational research, innovation, and entrepreneurship, advancing India's capabilities in drug discovery, precision biology, and technology-driven translational research

Speaker:

Dr. Ravindra Dubey

Managing Director,
PhiBonacci Learning Pvt. Ltd.



Dr. Ravindra Dubey is a visionary entrepreneur and cognitive neuroscientist with over 23 years of experience in pioneering hyper-interactive immersive technologies and Industry 4.0 solutions. As the Managing Director of PhiBonacci Learning, he leads a pioneering tech-enabled organization recognized for developing the largest libraries of 3D simulations and Extended Reality (XR) content.

With a Ph.D. in Cognitive Neuroscience, and a management graduate from the prestigious Indian School of Business, Dr. Dubey possesses a unique multidisciplinary background that bridges the gap between biological sciences and digital innovation. He espouses a neuro-scientific approach to problem-solving, leveraging deep insights into cognitive mechanisms to drive advancements in immersive learning, and behavioral adaptations. Throughout his career, Dr. Dubey has created business solutions that integrate hyper-interactive technologies across the Healthcare and Education sectors.

Passionate about futuristic ventures and technology, Dr. Dubey focuses on creating scalable opportunities that make a positive impact on society. He leads an "exceptionally-abled" team dedicated to pushing the boundaries of what is possible in the bio-digital and immersive technology landscape. His teams' creations have earned global recognitions, including the prestigious Snapdragon Spaces' "Auggie Award" for XR content and the "Disruptor of the Year" Award at Bett Asia.

Speaker:

Dr. Saurov Mahanta

Senior Technical Officer
NIELIT Guwahati



Dr. Saurov Mahanta, PhD, is a resident of Guwahati, Assam, India, and working for the National Institute of Electronics and Information Technology, Guwahati, under the Ministry of Electronics and Information Technology, Govt. of India. Dr. Mahanta did his master's in Molecular biology and Biotechnology from Tezpur University, Tezpur Assam and he got the PhD. degree from Gauhati University, Assam for his work on Computational Drug Discovery for Tuberculosis. Dr. Mahanta is actively involved in Bioinformatics based drug discovery works using Combinatorial Chemistry, Molecular Docking, Molecular Modelling, Molecular Dynamics and related analysis. His research area includes Structure-based drug discovery studies for COVID-19, Breast & Stomach cancer, Alzheimer's disease & Tuberculosis. He is also involved in Nano-informatics-based research using proteins of different pathogens. Dr. Mahanta has 20 years of Research experience, and he is so far credited with 40+ Research Publications, 3 Edited Book and 2 International Book chapter and 02 Indian Patents and 01 UK patent.

Additionally, At NIELIT, Dr. Mahanta has been involved in designing and implementing ICT-based solutions for capacity building, e-governance, and digital literacy programs, helping to strengthen India's technology ecosystem. He has also collaborated with government agencies, academic institutions, and industry partners to ensure effective adoption of innovative ICT solutions and standards. Known for his technical expertise, research rigor, and mentorship, Dr. Mahanta actively supports training, workshops, and knowledge-sharing initiatives, fostering skill development among young professionals and researchers. His contributions reflect a sustained commitment to advancing India's digital capabilities, promoting technological self-reliance, and empowering communities through ICT-enabled solutions.

Patron:

Dr. Madan Mohan Tripathi

Vice-Chancellor, NIELIT Deemed to be University
Director General, National Institute of Electronics & Information
Technology (NIELIT)



Dr. Madan Mohan Tripathi is the first Vice-Chancellor of NIELIT Deemed to be University and the Director General of NIELIT, a premier national institution under the Ministry of Electronics and Information Technology (MeitY), Government of India. A distinguished academician, researcher, and administrator, he brings over three decades of rich experience in electronics, information and communication technology, research management, and institutional leadership.

Prior to joining NIELIT, Dr. Tripathi served as a Professor at Delhi Technological University (DTU), New Delhi, where he also held key administrative roles as Director, Internal Quality Assurance Cell (IQAC) and Coordinator, Intellectual Property Rights (IPR) Cell, contributing significantly to quality assurance and innovation ecosystems.

He began his professional career in 1994 as a Research Scientist at the Institute for Plasma Research (IPR), Gandhinagar, Department of Atomic Energy, Government of India, where he worked on several R&D projects for five years. In 1999, he joined the Centre for Electronics Design & Technology of India (C-EDTI), Gorakhpur (now NIELIT) as a Senior Design Engineer, and for a decade contributed to major design and development projects in IECT domains.

From 2009 to 2012, as Joint Director at NIELIT Headquarters, he played a pivotal role in nationally significant initiatives including the National Population Register (NPR) digitization and biometric capture project, ICT-based skill development, and technology-enabled skill testing and certification, strengthening India's digital and human capacity infrastructure.

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KIPM Innovators Foundation (KIF) is an Incubation Center committed to nurturing creative ideas, promoting entrepreneurship, and supporting national development priorities. Established in 2022, the center enables early-stage ventures through idea validation, start-up formation, and sustainable growth, supported by structured mentorship, industry collaboration, and investor engagement.

Operating under KIPM College of Engineering & Technology, GIDA, Gorakhpur, and guided by the visionary leadership of Er. R. D. Singh, Chairman, KIPM Technical Campus, with Mrs. Sunita Singh as Director and Mr. Shivansh Vikram as Chief Executive Officer, the foundation has successfully incubated 16 start-ups across diverse innovation and technology domains (3D printing, IoT, AI, Electronics, AgriTech etc). A student-led start-up from the incubation center received an award and formal recognition from the Hon'ble Governor of Uttar Pradesh during the AKTU Convocation 2025.

Recognized under the StartInUP initiative and funded by Uttar Pradesh government, KIF functions from a 11700 sq. ft. dedicated incubation facility with the capacity to support 25 start-ups. The center houses 3D printing and fabrication Lab, a high-performance computing facility powered by NVIDIA GeForce RTX 5090 GPU, a Podcast Facility, a professional Recording Studio, and modern collaborative workspaces.

We are the first technology-driven incubator in Eastern Uttar Pradesh (Purvanchal), KIF continues to foster a strong culture of innovation, empowering entrepreneurs to transform ideas into scalable ventures and contribute meaningfully to India's growing start-up ecosystem. Through focused capacity building, hands-on prototyping, and market-oriented support, KIF bridges the gap between academic innovation and industry-ready start-ups. We would welcome the opportunity to connect and explore this further.

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3rd Eye Techno Solutions is an ISO 9001 certified, technology-driven, and fast-growing organization. The company was founded with a clear vision: to identify evolving technological challenges faced by government agencies, law enforcement bodies, institutions, and enterprises, and to deliver reliable, secure, and customized solutions in field of cyber forensics.

The company is backed by a highly experienced and dedicated team of professionals with strong technical expertise and deep domain knowledge. Our team members possess extensive experience working closely with Government departments, Police forces, Cyber Crime Cells, Law Enforcement Agencies, and regulatory bodies. These strong roots within the government and law-enforcement ecosystem allow us to clearly understand procedural requirements, legal sensitivities, chain-of-custody norms, and evidentiary standards. This insight enables us to deliver solutions that are not only technologically advanced but also compliant with applicable laws, guidelines, and judicial expectations.

3rd Eye Techno Solutions offers a comprehensive portfolio of Digital Forensics solutions, services, and training programs to both Government and Private Sector organizations. Our digital forensics offerings are designed to support investigation, analysis, evidence preservation, and reporting across a wide range of cyber and electronic crime scenarios. We specialize in Cyber Forensics Solutions that assist investigators in the examination of computers, mobile devices, storage media, and digital artifacts related to cyber fraud, financial crimes, data breaches, and other technology-enabled offenses. Our solutions help agencies extract, analyze, correlate, and present digital evidence in a legally defensible manner.

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ABSTRACTS NICEDT-2026

Paper ID: 12, TITLE: Plant disease detection for sustainable agriculture

Authors: Aakash Kumar, Kaleemullah Shaikh, Shashank Kumar Singh, Dr. Anirban J. Hati and Dr. Jayaraj U Kidav

Abstract: Agriculture plays a vital role in the global economy, providing essential resources and employment. However, plant diseases remain a significant threat to crop productivity, leading to substantial economic losses and food insecurity. Early and accurate detection of plant diseases is critical for effective disease management and crop protection. Traditional disease identification methods rely heavily on human expertise, which can be time-consuming, error-prone, and inaccessible in rural areas. To address these challenges, this project presents an automated plant disease detection system utilizing the ResNet-34 deep convolutional neural network. ResNet-34, known for its residual learning capability, enables the construction of deeper networks without the degradation problem, improving classification accuracy. Using the Plant Village dataset, which includes over 60,000 labeled leaf images spanning multiple crop species and diseases, our system was trained to detect and classify 38 different plant disease conditions. The implementation involved image preprocessing, data augmentation, transfer learning with pretrained ImageNet weights, and finetuning of the ResNet-34 model. The model achieved a high level of accuracy on both validation and test sets, demonstrating its potential as a reliable tool for precision agriculture. This system offers a scalable, efficient, and cost-effective solution to aid farmers and agronomists in disease diagnosis, ultimately contributing to improved crop health and agricultural sustainability.

Keywords: CNN, ResNet-34, plant diseases detection.

Paper ID: 18, TITLE: The Cycle of Digital Depression: How Instagram's Algorithm Amplifies Emotional Imbalance Through Content Reinforcement

Authors: Sarita Kaur, Shameem Nahvi and Vidya Arnav

Abstract: The use of social networking sites (SNS) has radically changed the way we interact with each other and view ourselves. Users are particularly impacted by Instagram, a photo-sharing site, as it is the most visual SNS. Among younger generations, this site has

the greatest potential for influence due to its visual appeal. The algorithm that runs Instagram is designed to keep users engaged by exploiting their already high levels of emotional arousal. In doing so, users may experience deeper feelings of negative emotion, including, but not limited to, sadness, anxiety, and digital depression. The research conducted for this thesis utilized survey questionnaires and behavioral analysis to determine how the reinforcement of Instagram content affects users' emotional health. It was determined that users who spend an extended period of time-consuming content promoted by the algorithm, particularly content on ideal body types, social comparisons, and personal achievements, suffer greater levels of isolation and a diminished sense of self-worth. This data provides an excellent basis for developing an ethical responsibility to design social networking site platforms in such a way as to promote the well-being of users. This responsibility includes ensuring that algorithms are designed with the users' emotional well-being as a priority, increasing transparency in algorithm operation, providing better/more meaningful content, and intentionally providing for the diversity of content. By providing the user with a focus on emotional balance as opposed to endless engagement with content, we can create a healthier online environment that supports users and does not exploit their vulnerabilities.

Keywords: Algorithmic bias, content reinforcement, Digital depression

Paper ID: 33, **TITLE:** Actuator State Estimator based Cascade Control for Process Automation

Authors: P T Sasidharan and Ranjan Maheswari

Abstract: In process automation, fluid flow, level and pressure systems have major importance. In conventional process automation, PID control strategies are employed. The manipulated variables are often fluid flow rates. In these applications processes that are open loop unstable such as integrating process with dead time (IPDT) having actuator nonlinearity and dead time pose great challenges. Control of process units with such elements demand combinations of PID and model-based methods such as cascade, feed forward, internal model control etc. Internal Model Controllers (IMC) based PID gain calculations are widely used for processes with dead time. Cascade PID control can give disturbance reduction and faster response but requires additional measuring instruments. In this paper, an actuator state space model-based estimator along with conventional

cascade control with IMC tuned PID controllers are used. Actuator nonlinearities such as friction are modeled and included in the estimator calculations. The actuator state variables are estimated using an Extended Kalman Filter. One major advantage of the present method is that nonlinear actuator characteristics can be included; also the state estimation is limited to actuator model only. Using state estimates and low cost measuring instruments results in reduced cost and is an advantage. Since measurement is taking place at the point of process manipulation, delay is small. Also, implementation is easy using PID control loops. An in-house developed process automation training plant is used to demonstrate the effectiveness of the proposed method. The simulation and experimental study shows that the proposed method is robust and is performing well with better results.

Keywords: Process control, Internal Model Control, Actuator nonlinearity, Estimation, PID, cascade control

Paper ID: 35, TITLE: A Comprehensive Survey and Research Directions of Evolution of Database Query Optimization

Authors: Laishram Simran Devi

Abstract: The accelerated rate of data-driven environment has increased the demand of efficient, scalable, and dynamic database management systems (DBMS). The optimization of database queries has taken the shape of advanced AI-based methods as opposed to the manual methods of tuning that were previously developed to improve the performance, scalability and use of resources. This paper provides a thorough overview of the evolution of query optimization, with focus on the application of artificial intelligence (AI) and machine learning (ML) in database technologies. The paper examines the various AI based database query optimization methods, emphasize in reducing query response time, improving the use of available system resources and reduced manual intervention. The survey is extensive in describing the Artificial intelligence (AI) techniques like machine learning, deep learning, and reinforcement learning that are implemented to tackle the key database management tasks that include query rewriting, indexing, caching, efficient resource allocation, and performance optimization. The results show that the query execution time, resource usage, and system overall performance have been improved significantly in comparison to the traditional optimization strategies. In spite of these developments, it also has some challenges including high computing costs, integrating with

legacy systems, low transparency of AI models and jeopardizing data security and privacy. In addition, a good number of experiments have been done under controlled or simulated environments, which challenges their ability about scalability and reliability in the context of the real environment. The paper also highlights the key gaps and future work, such as hybrid optimization strategies, interpretable AI solutions, scalable design solutions, and effective security systems. The conclusion of the findings is that the transformative effects of AI to database management is only achievable once these limitations are addressed so that practical, secure and autonomous DBMS solutions can be realized.

Keywords: Artificial Intelligence, Machine Learning, Database management systems, AI-based Databases, Database Query Optimization, Database Tuning.

Paper ID: 41, TITLE: IMPROVING LANE DETECTION PERFORMANCE IN AUTONOMOUS DRIVING UNDER REAL-WORLD CONDITIONS

Authors: Gunendra Singh Tonjam and Monita Wahengbam

Abstract: Self-driving cars rely on precise lane identification to ensure the car's journey is safe and efficient. The paper introduces a framework of LD with the help of DL and optimizes the preprocessing and detection pipeline. The input road images are re-oriented with a BEV, whereby the perspective is minimised to increase lane visibility. Subsequent to this, an ROI is set to isolate the space that is drivable, enhancing the efficiency of computation. Three sophisticated DL Modules of Spatial CNN (SCNN), ENet, and LaneNet are utilized to perform feature extraction and LD. These models use spatial features in identifying the lane boundaries in different road and lighting conditions. To smooth and shape the detected lanes, the polynomial curve fitting is employed as a post-processing step. In the system, the performance is measured with the help of the Lane Line Detection Dataset provided by Kaggle, and the major metrics are accuracy, the average lateral error (ALE), and the number of frames per second (FPS). One of the tested models, LaneNet, showed better results in terms of reaching higher and lower levels of accuracy and ALE, in addition to the real-time processing rates. Their findings can indicate that the suggested method with specification on LaneNet will be exceptionally helpful in the areas of LD since it is so robust in any real-world autonomous driving task.

Keywords: Autonomous Driving, LD(LD), Deep Learning (DL), Real-Time Processing, Bird's Eye View (BEV), Region of Interest (ROI), Performance Evaluation, Intelligent Transportation Systems (ITS), Driver Assistance, Lane Departure Prevention.

Paper ID: 42, TITLE: Hybrid Model For Breast Cancer Classification Using Deep Learning

Authors: Dharmendra Kumar Mishra, Ravi Rastogi and Ghanshyam Mishra

Abstract: Breast cancer is still one of the most common cancers in women around the world, which makes it hard to find early and treat effectively. We look at how deep learning can be used to sort histopathological images of breast cancer into different types in this study. Our model uses convolutional neural networks (CNNs) to accurately tell the difference between Invasive Ductal Carcinoma (IDC) and healthy tissues. We use a large dataset of labelled tissue patches to do experiments where we look at how different architectural designs and training strategies affect the performance of classification. Our findings show that deep learning models are more accurate than traditional machine learning methods. This shows that neural networks could be used to improve the accuracy of diagnoses. We also talk about what our results mean for clinical practice and where we think future research in automated breast cancer detection should go. The goal of this paper is to show how deep learning techniques can help improve the classification of breast cancer. It will also be used as a starting point by researchers who want to make the use of AI in oncology even more advanced.

Keywords: Breast cancer, Deep learning, Convolutional neural network (CNN), Invasive Ductal Carcinoma (IDC)

Paper ID: 43, TITLE: Advanced Performance Evaluation of a DynaLock PI based DPLL Across Technology Nodes Using Open-Source EDA Tools

Authors: Mukul Kumar, Prashant Pal, Ravi Rastogi, Ritesh Pratap Rao and Yogesh Kumari

Abstract: As semiconductor technology advances, the demand for efficient and scalable digital design methodologies continues to grow. Open-source Electronic Design

Automation (EDA) tools offer a cost-effective and transparent alternative for exploring the complexities of Very Large Scale Integration (VLSI) design. This paper presents a novel DynaLock Proportional-Integral (PI) based Digital Phase-Locked Loop (DPLL) implemented using a fully open-source EDA workflow. Based on the proposed design of DynaLock PI based DPLL an exhaustive analysis of design scalability, interconnect complexity, and timing behavior across multiple technology nodes has been done, leveraging a structured methodology that integrates front-end synthesis, physical design, and post-layout analysis has been done using the open-source EDA tools like Yosys, Graywolf, QRouter, Magic, Netgen, Vesta, etc. A comparative analysis provides insight into the impact of design constraints, layout efficiency, and timing trade-offs, offering valuable perspectives on the feasibility of open-source tools for modern digital circuit design. The results contribute to the ongoing evolution of open-access methodologies in VLSI research, highlighting their potential in advanced semiconductor development. Recent advancements in statistical static timing and machine learning integration have further motivated the refinement of DPLL performance across technology nodes.

Keywords: Proportional-Integral (PI), Digital Phase-Locked Loop (DPLL), Open-Source Electronic Design Automation (EDA), Static Timing Analysis (STA), Interconnect Complexity and Parasitic Extraction, Technology Scaling and Timing Closure.

Paper ID: 50, TITLE: CAFE-XAI: A Hybrid Explainable Machine Learning Framework for Malware Detection

Authors: Abhinav Mishra, Prof Upendra Nath Tripathi, Ajay Verma and Pawan Kumar Mall

Abstract: The need for improved malware detection technology to strengthen cybersecurity defenses is critical as cyberattacks become more complex. This research proposes a causality-aware feature elimination framework for explainable machine learning. Cybersecurity techniques for anomaly detection are provided in this research. These technologies use machine learning (ML) and artificial intelligence (AI) to identify unusual patterns and behaviors that may indicate potential security flaws. This study highlights the importance of secure model training to prevent manipulation by threat actors, addressing issues such as adversarial robustness and model interpretability. The paper ends with suggestions for further

investigation into the scalability of neural network-based cybersecurity systems for strong, self-sufficient defenses.

Keywords: Artificial Intelligence, Cybersecurity, Machine Learning, Malware Detection, Feature Elimination

Paper ID: 53, TITLE: DeTR-OCR: Combining DETR and Transformer-Based OCR for Real-Time Video Caption Extraction

Authors: Abhishek Kumar Mishra, Kapil Kumar and Sanjeev Bhardwaj

Abstract: The rapid proliferation of video content across digital platforms necessitates robust systems for extracting textual captions in real time, a task fraught with challenges like motion blur and diverse text styles. This paper introduces DeTR-OCR, an novel framework that integrates Detection Transformer (DETR) with transformer-based Optical Character Recognition (OCR) to address these complexities. Leveraging DETR's set prediction paradigm and TrOCR's recognition prowess, DeTR-OCR achieves end-to-end caption extraction from video streams. Evaluated on the ICDAR 2017 Multi-Lingual Scene Text (MLT) and NewsVideos-Text datasets, the system yields a mean Average Precision (mAP) of 0.82 and Character Error Rate (CER) of 0.09 on ICDAR, alongside 28 frames per second (FPS) for real-time performance. Comparative analyses reveal superiority over baselines like EAST and Tesseract, while ablation studies underscore the efficacy of adaptive frame sampling. Despite challenges with low-contrast text, DeTR-OCR offers a promising solution for live subtitling and accessibility, paving way for future advancements in video text processing.

Keywords: Video Caption Extraction, Detection Transformer, Optical Character Recognition

Paper ID: 55, TITLE: Mobile Forensics in India: Challenges, Tools, and Adaptive Strategies

Authors: Ronaldo Deka, Syed Mufassir, Ajaz Ahmad, Ashaq Hussain and Akeel Aijaz

Abstract: Mobile devices are now deeply woven into everyday life, making them a rich source of evidence for digital investigators. At the same time, the very technologies that

protect user privacy—such as advanced encryption and reliance on cloud storage—have created what experts call the “going dark” problem. In this study, we examined the performance of widely used forensic tools on Android, iOS, and IoT devices that are common in India. Our results indicate that commercial tools usually provide better outcomes, but recovering deleted information remains difficult, with success rates often limited. Cloud-based evidence brings its own challenges, especially when legal procedures are involved. To overcome these obstacles, we suggest more flexible strategies that integrate AI to speed up investigations and give greater attention to cloud data. Finally, we outline the impact of India’s new data protection law and present practical guidance to help forensic professionals manage both technical and legal complexities.

Keywords: Mobile Forensics, Encryption Challenges, Cloud Data Recovery, Digital Evidence, AI-Assisted Forensics, Forensic Tools

Paper ID: 57, TITLE: SmartNewsQA: An AI-Powered News Reading and Question Answering System

Authors: Kumar Harsh, Pawan Mall, Vineeta Vineeta and Abinav Mishra

Abstract: Large Language Models (LLMs) have made it possible to develop chatbots that enhance news audience interaction and handle intricate question-answering (QA) scenarios. News articles present complex narratives. Current search engines lack the ability to understand and return full documents instead of exact answers. Users must manually sift through content, a time-consuming task. Large Language Models (LLMs) have enabled the development of intelligent chatbots that can enhance news audience engagement and perform sophisticated question-answering (QA) tasks. News stories often involve complex narratives, while today's search engines provide entire documents rather than exact answers, requiring users to manually sift through content. This paper introduces an AI-driven News Reader and QA System that utilises natural language processing (NLP) and deep learning models—namely, LSTM, Bi-LSTM with Attention, and transformer-based BERT—to directly extract contextually appropriate answers from news articles. Experimental results on various QA datasets demonstrate that although the baseline LSTM serves as a good benchmark, the Bi-LSTM with Attention outperforms it dramatically, achieving perfect Exact Match (EM) and F1 scores, which highlights the significance of attention mechanisms. The system has the potential to enhance information retrieval in

journalism, education, healthcare, and public administration by delivering accurate, context-aware, and time-saving responses.

Keywords: Machine Reading Comprehensionl, BERT, NLP, Deep Learning, News QA, SDG

Paper ID: 59, TITLE: An Evaluation Framework for Hashing, Data Extraction, and Network Forensic Tools in Cybercrime Analysis

Authors: Syed Mufassir, Ronaldo Deka and Ashaq Hussain

Abstract: Digital forensic investigations face several challenges, particularly in keeping evidence intact, extracting data, and analyzing network activity. Hashing tools provide unique fingerprints for each file to detect any tampering, but processing very large files can take a long time, and older algorithms sometimes have weaknesses that could affect a case in court. Extracting data from devices is also difficult. Encryption, cloud backups, and different operating systems create obstacles, and some files may be missed if tools fail to recover them completely. Network forensics adds another layer of complexity. High traffic volumes and encrypted communications make it hard to capture all relevant information. This study evaluates commonly used forensic tools in these three areas. Tools were tested for speed, accuracy, and reliability across various devices and scenarios. Findings show that combining multiple tools and carefully planning workflows improves confidence in evidence. Recommendations include enhancing tool performance and integrating processes to make investigations faster and more dependable.

Keywords: Digital Forensics, Cybercrime Investigation, Hashing Algorithms, Data Recovery, Encryption Challenges, Workflow Integration, Cloud Forensic

Paper ID: 62, TITLE: Gen Z's Social Commerce Journey: Insights into Instagram Purchasing Practices

Authors: Sakshi Pandey, Ranjit Singh and Suman Agarwal

Abstract: This study explores the social commerce (s-commerce) experiences of Generation Z on Instagram through a qualitative approach, focusing on their purchasing behaviors across payments, policies, and expectations. Virtual interviews were conducted

with ten respondents—five from India and five from Nepal—to trace their buying processes on the platform. The research investigates how Gen Z engages with Instagram for purchasing products and services, highlighting differences in platform usage, payment preferences, and challenges encountered. Findings reveal that Indian respondents are more frequent users of Instagram for s-commerce, utilizing payment methods like UPI, Google Pay, and Paytm, while Nepalese respondents predominantly prefer established e-commerce platforms such as Daraz and Flipkart, using digital wallets like eSewa and Khalti. Both groups emphasized the importance of transparent product pricing during communication with sellers, though they frequently encountered price fluctuations, impacting trust and purchase decisions. The study identifies key themes influencing Gen Z's s-commerce behavior, including convenience, trust in payment systems, and platform policies. Indian respondents showed greater reliance on Instagram's integrated shopping features, while Nepalese respondents leaned toward external platforms due to perceived reliability. These findings contribute to understanding Gen Z's s-commerce preferences and highlight the need for improved pricing consistency and secure payment integration to enhance user trust. The study offers insights for policymakers, marketers, and platform developers to tailor s-commerce strategies for Gen Z, fostering safer and more efficient digital purchasing environments. Future research could expand to larger, diverse samples to validate these findings across other regions.

Keywords: Social Commerce, Gen Z, Instagram, Digital Payments, Qualitative Analysis

Paper ID: 63, TITLE: Offline Signature Verification Using CNN and Triplet Embedding Network with Data Augmentation

Authors: Jyotirupa Basumatary, Gourab Das and Mrs. Smriti Rekha Dutta

Abstract: In the field of biometric authentication, verification of signatures is essential for both personal authentication and the identification of forgery, particularly in offline environment. This paper presents a deep learning-based signature verification system. The proposed approach integrates a Convolutional Neural Network (CNN) and a Triplet network. The CNN consists of four convolutional layer followed by Global average pooling (GAP) layer and a dense embedding layer of size 64, which is used to learn characteristics of the signature image and convert them into vector embeddings and then trained it using triplets i.e., three images at a time: an anchor (genuine), a positive (another

genuine) and a negative (forged). The triplet network is trained with a triplet loss function where between the anchor and the positive embedding, the model minimizes the distance, while between the anchor and the negative embeddings, it maximizes it. The system is tested using a publicly available dataset that has been obtained from Kaggle. The dataset is organized with separate folders for genuine and forged signatures. Data Augmentation techniques are applied to improve the model performance and make the model robust. A threshold value of 0.2 is used to make sure that the genuine signatures are always closer to each other than the forged ones. The system evaluated an accuracy of 94.15% on test data with the Precision as 0.89, Recall as 1.00, F1 score as 0.94, FAR (False Acceptance Rate) as 0.11, FRR (False Rejection Rate) as 0.00, TAR as 1.00, AUC as 0.99 and EER (Equal Error Rate) as 0.02. This approach helps the system efficiently to distinguish between genuine and forged signatures.

Keywords: Triplet Network, Signature Verification, CNN, Data-augmentation, Forgery Detection, Embedding Learning

Paper ID: 65, TITLE: UPI Fraud Detection Using Ensemble Approach

Authors: Bendangmenla Imsong, Rebeca K Yeptho, Monita Wahengbam and Lanuwabang L

Abstract: Unified Payment Interface (UPI) has paved the way for convenient digital transaction and has enhanced the speed of digital transaction. Users can simply use the technology to make online payments at an accurate speed through mobile number, Virtual Payment Address (VPA) or QR code. But with the evolving technologies and advanced system, there has been cases where fraudulent activities are encountered leading to financial risk and losses. In order to tackle this problem, this research develops an ensemble RNN and XGBoost system for detecting UPI fraud by examining the patterns to recognize and alert on potentially fraudulent activities. It also encompasses data cleaning and preparation, and training of predictive models. Dataset from open source has been trained and tested against the Ensemble RNNBoost (Ensemble RNN and XGBoost) model and has been compared with various ML models. The model's performance was assessed using various evaluation metrics, including F1-score, precision, recall, and accuracy. The main reason to combine XGBoost and RNN is to exploit sequential patterns and tabular feature interactions simultaneously, leading to overall performance and more robust predictions.

As a result, RNNBoost model produce the maximum accuracy rate of 96.44% in comparison with other traditional models like DT (95.00%), RF (95.88%), LR (80.25%), KNN (83.00%), SVM (83.00%), NB (83.00%) and RNN (81.25%).

Keywords: Ensemble RNNBoost, Fraud detection, RNN, Transaction, UPI

Paper ID: 66, TITLE: Toxic Tweet Detector: Automated Detection and Classification of Hate Speech and Abusive Language on Twitter

Authors: Poulomi Deb, Priyanka Biswas, Nirmalya Kar and Binoy Das

Abstract: In the era of digital communication, social media platforms like Twitter have become primary venues for public discourse, but the proliferation of hate speech and abusive language poses significant challenges to creating safe online environments. Our project presents the "Toxic Tweet Detector," a comprehensive solution for automated detection and classification of toxic content on Twitter through advanced Natural Language Processing (NLP) techniques and machine learning algorithms. Our methodology integrates traditional machine learning approaches including Support Vector Machines (SVM), Logistic Regression, and Naive Bayes with modern deep learning techniques for realtime harmful content identification. The binary classification system consolidates offensive language and hate speech detection into a unified framework, streamlining content moderation processes. Our preprocessing pipeline addresses Twitter-specific challenges including slang, abbreviations, and informal language patterns through systematic text normalization, noise removal, and feature engineering using TF-IDF vectorization with bi-grams. Experimental results demonstrate superior performance compared to existing methods, with our Logistic Regression model achieving 81% accuracy and 65% F1-score, outperforming previous approaches by an average of 3-4%. The system incorporates VADER sentiment analysis for enhanced contextual understanding and provides real-time classification through a user-friendly Streamlit interface. Our research contributes to the advancement of automated content moderation systems and promotes safer digital communication environments.

Keywords: Hate Speech Detection, Twitter Analysis, Natural Language Processing, Machine Learning, Content Moderation, Binary Classification, Text Mining, Social Media Moderation.

Paper ID: 67, TITLE: A Comprehensive Study of Modbus/TCP Protocol Vulnerabilities Introducing Tri-dimensional Assessment and Secure Network Architecture for Industrial Control Systems

Authors: Awdhesh Kumar Singh, Visiezo Dahou, Neisetuonuo Metha, Monita Wahengbam and Lanuwabang L

Abstract: This paper focuses on the Modbus/TCP protocol, which is regarded as one of the most frequently used protocols and is highly vulnerable to cyberattacks when exposed to public networks. A series of attacks, including information gathering, denial-of-service (DoS), and data manipulation, were conducted within an Industrial Control System (ICS) environment. Detailed forensic examinations of the security events were then carried out to identify key traces and evidence. This approach demonstrates how forensic analysis can be performed on security events within an industrial network that was exposed to the public Internet. Finally, the full cycle of a cyberattack on the Modbus/TCP protocol, from initial information gathering to DoS execution, is investigated, and enhancements are suggested to improve the accuracy and coverage of virtual testbed analysis. This research introduces a tri-dimensional analysis framework that combines vulnerability assessment, forensic validation, and impact assessment. This framework highlights the protocol and configuration flaws, validates forensic methods used for tracing malicious activities. It will provide a clear picture of how a cyber incident can escalate into the industrial systems. The study also recommends a secure network architecture for Information Technology (IT) and ICS/Operational Technology (OT) environments, it emphasizes strong segregation between IT and OT networks, using Demilitarized Zone (DMZ) to control data exchange and segmentation to limit attacker movement. Combined with compliance to standards such as National Institute of Standards and Technology (NIST) and International Electrotechnical Commission (IEC) 62443, and supported by structured employee training and awareness programs, it helps build a layered defense that can strengthen the cybersecurity posture.

Keywords: Industrial Control System (ICS), Operational Technology (OT), virtual testbed, Modbus/TCP, Denial of Service (DoS), Forensics Analysis, Human Machine Interface (HMI), Programmable Logic Controller (PLC), Supervisory Control And Data Acquisition (SCADA)

Paper ID: 68, TITLE: High Speed DataPath Circuit Design Using Domino Logic

Authors: Kalavathi Devi T, Mouleeshuwarapprabu R, Baluprithviraj K N, Chandrabharathi M, Balachandru S, Harshavarthini R and Joswika S

Abstract: Combinational circuits are essential for data n path cells in order to maximize performance and guarantee that integrated circuit designs are proper. Combinational circuits enable effective data processing and manipulation by facilitating a variety of arithmetic operations that are crucial to microprocessors. Their incorporation into data path cells improve performance and functionality. This study uses domino logic to construct and analyze a number of important digital components, including adders, subtractors, encoders, decoders, multiplexers, and demultiplexers. Compared to conventional static CMOS designs, this dynamic CMOS logic architecture delivers faster speed and reduced power usage. The fundamental idea of pre-charge and assessment phases regulated by a clock signal is used to construct each circuit. Performance is observed to be enhanced when the circuits are constructed using optimized pull-down networks. Simulation of the logics at transistor level is designed in LT-SPICE and the netlist is used in the VIVADO for implementation in FPGA BASYS board. Overall, simulation results show that these domino logic-based designs achieve around 20–40% lower power consumption and up to 1.5 times improvement in speed, making them suited for modern low- power, high-performance VLSI applications.

Keywords: Combinational circuit, DOMINNO Logic, CMOS Logics, Data path cells, LTSPICE

Paper ID: 69, TITLE: IoT-Driven Smart Waste Management with Integrated Security for Urban Environments

Authors: Tazkiya Maryam, Inhsa Amin, Irshad Ahmed, Syed Mufassir Yaseen, Akeel Ajaz Malik and Ajaz Ahmad Kumar

Abstract: As urban populations continue to grow, cities are facing increasing pressure to manage waste more efficiently. This paper introduces Smart Bin, an IoT-powered waste monitoring system designed to improve how waste is collected and handled in smart city

environments. The system uses an ultrasonic sensor and IR sensor paired with an ESP8266 microcontroller to measure bin fill levels, transmitting real-time updates to the cloud via Wi-Fi. A lightweight, responsive ThingsBoard dashboard is used to display bin data such as fill level and status. When bins reach critical thresholds, alerts are automatically generated, and Twilio's API delivers SMS notifications that include a URL to the bin's location, allowing collection staff to easily navigate to it. To ensure data integrity and system security, the architecture employs TLS/HTTPS encryption, AES-secured payloads, and HMAC-based authentication to prevent unauthorized access. Although the current system focuses on real-time monitoring and efficient alerting, it is designed to be scalable and adaptable for future upgrades.

Keywords: Waste Management, Automation, Internet Of Things, Sensors, Smart City Applications, Node-MCU

Paper ID: 77, TITLE: The Rise of Quantum IoT in Smart Healthcare: A Technical Review of Frameworks and Future Directions

Authors: Poulomi Deb, Akshay Reang, Prantosh Debbarma, Kumar Amitabh and Debadrita Pal

Abstract: Digitalization of Healthcare by using internet-connected medical equipment enables new, put up data-driven approaches to monitoring patients and clinically making decisions. Nevertheless, the modern internet connected system is inherently restricted by the deficiencies in the processing speed, susceptibility to cyber - attacks, and the shortage of resources in case complex medical data sets are considered. Incident quantum-mechanical effects like superposition of particles, quantum entanglement and interference of waves have provided radical solutions to these technological bottlenecks. The review surveys the recent QIoT deployments of 2021-2025 that establish benchmarks on the difference between the performance of a traditional and quantum-enhanced medical infrastructure. The paper is talking about the base system components, the designs of multilayer architecture, and advancement as a research in future. Special attention is paid to deployment issues, consideration of scaling of the system, and security issues of quantum-driven medical networks.

Keywords: Post Quantum Cryptography, Quantum Communication, Quantum Internet of Things, Quantum Key Distribution, QIoT Architecture

Paper ID: 84, TITLE: Developing Machine Learning Models for Real-Time Fraud Detection in Online

Authors: Alok Bhatt and Rajeshvar Prasad

Abstract: Fraudulent transactions pose a significant global threat as digital payments grow, costing economies billions annually. In this context, machine learning (ML) has emerged as a critical tool for real-time fraud detection. We survey ML-based systems that process global online transaction streams using algorithms (e.g. Random Forest, XGBoost, neural networks) to identify fraud patterns within milliseconds. Both supervised and unsupervised techniques are employed, often in hybrid ensembles, to address fraud's complexity and adapt to evolving schemes. To mitigate severe class imbalance, methods like SMOTE oversampling are frequently applied. Recent reports show ensemble models achieving >99% accuracy with precision/recall around 0.98. Figure 1 shows the distribution of ML algorithms used in fraud detection studies, and Table 1 compares representative model performances from recent work. Industry applications are exemplified by PayPal's ML-driven platform leveraging global account networks for real-time risk scoring, and Visa's AI-powered system computing per-transaction risk scores (~20 ms each) with an 85% reduction in false positives. We also discuss challenges such as concept drift, interpretability (e.g. SHAP explanations), and regulatory compliance, noting emerging techniques like graph neural networks for relational fraud patterns. This review compiles insights from recent studies to outline current strategies and challenges.

Keywords: online fraud detection, machine learning, real-time analytics, anomaly detection, class imbalance, ensemble learning, neural networks, financial security

Paper ID: 86, TITLE: Applications of Deep Learning, AGI-Inspired Knowledge Discovery, and Explainable AI in Options Trading: A Comprehensive Review

Authors: Partha P Adhikari, Vineeta Khemchandani and Neetu Sharma

Abstract: Options trading represents a complex area within financial markets, where nonlinear and volatile influences shape valuation and risk management. Traditional models, including the Black–Scholes framework, offer theoretical underpinnings but exhibit limitations in capturing evolving market dynamics. This review investigates the roles of Deep Learning (DL), Artificial General Intelligence (AGI)-inspired frameworks, and Explainable AI (XAI) in advancing research and practice in options trading. The analysis systematically surveys literature on DL architectures (LSTM, CNN, GNN), AGI-inspired methods (transfer learning, cognitive reasoning, knowledge graphs), and XAI techniques (SHAP, LIME, counterfactuals). Publications from 2007 to 2025 are evaluated for their contributions, limitations, and relevance to option pricing, volatility forecasting, and risk management. DL models demonstrate superior predictive accuracy compared to classical approaches, yet encounter challenges related to overfitting and interpretability. XAI contributes to transparency, investor trust, and regulatory compliance. AGI-inspired frameworks offer adaptability and contextual reasoning, although they remain primarily conceptual with limited empirical validation. This paper synthesises fragmented research, identifies key challenges in data quality, model scalability, and regulatory compliance, and proposes a future benchmarking framework that incorporates standardised datasets, hybrid interpretable models, and adaptive evaluation metrics. The review positions DL, AGI, and XAI as complementary paradigms for developing trustworthy and explainable options trading systems.

Keywords: Options Trading, Deep Learning (DL), Artificial General Intelligence (AGI), Explainable AI (XAI), Knowledge Graphs, Financial Market Forecasting, Trustworthy AI

Paper ID: 88, TITLE: Drishti-NAV: A Real-Time Smart Mobility Aid Using Deep Learning For Visually Impaired Person

Authors: Surajit Paul, Indeerjeet Kumar, Angshuman Chakraborty and Bishnulatpam Pushpa Devi

Abstract: Helping visually impaired people move safely and on their own in complicated places is still a big challenge. This research introduces Drishti-NAV, a smart navigation system that uses the Internet of Things (IoT) to help the visually impaired. It helps with seeing objects, avoiding obstacles, and knowing where they are in real time. The system uses a Raspberry Pi 4 and a PiCamera Rev 1.2 to detect objects using a YOLOv11n model

that isn't too heavy. It also uses an ultrasonic sensor called HC-SR04 to measure distance and a NEO-6M GPS module to track location in real time. The system uses text-to-speech called PIPER-TTS to give voice feedback, so users can hear about what's around them. There's also a button that can be pressed in an emergency, which sends an email with the user's live GPS location through Gmail SMTP. The system is built using Python and OpenCV, and it uses multithreading to handle tasks at the same time, making it work quickly and smoothly. Drishti-NAV is meant to improve how visually impaired people understand their surroundings and move around on their own, offering a cheap and portable way to navigate outdoors.

Keywords: Visually Impaired, Smart Navigation, YOLOv11n, GPS, Obstacle Detection, IoT, Text-to-Speech.

Paper ID: 89, TITLE: Comparative Analysis of YOLO Models for Automated PCB Defect Inspection

Authors: Kailashpati Dhungia, Ankit Kumar, Gaddi Suresh Kumar and Sunil Kumar

Abstract: Detection of defects on the surfaces of printed circuit boards (PCBs) is extremely significant in ensuring that electronics are of good quality and functional. Manual inspection methods in the past are usually time consuming, prone to human error and fail to match the demands of the fast moving production set-ups. To address these challenges, this paper is giving a comparative analysis of advanced YOLO (You Only Look Once) object detection models on PCB surface defect inspection automation. The study evaluates nine YOLO variants like YOLOv5n, YOLOv5s, YOLOv5m, YOLOv8n, YOLOv8s, YOLOv10n, YOLOv10s, YOLOv10m, and YOLO11n, using an enhanced version of the publicly available HRIPCB dataset, which contains 10,668 high-resolution annotated images across six common defect categories. Each model was trained and assessed in equal sizes (600x600) in PyTorch and Ultralytics platforms, and the experiments were performed in 50 and 100 epochs in Google Colab (T4 GPU) and Kaggle Notebooks (T4x2 GPU) platforms. Models were compared based on standard accuracy measures, such as precision, recall, and mean average precision (mAP@0.5 and mAP@0.5:0.95), and speed measures such as inference time, FPS, and per-image processing time, where accuracy is taken as the top priority. Among all variants, YOLOv8s achieved the most favorable balance of accuracy and speed, reaching a mAP@0.5:0.95 of

67.60% while maintaining real-time inference capability. A lightweight, cross platform Streamlit web application was also developed for practical deployment, supporting image upload, capture features, webcam integration, and confidence threshold adjustment. This study offers actionable insights into YOLO model selection for PCB defect detection in industrial environments and highlights the suitability of YOLOv8s for deployment in real-time manufacturing inspection systems.

Keywords: YOLO, PCB defect detection, Object detection, Deep learning, HRIPCB dataset, YOLOv8, Industrial automation

Paper ID: 92, TITLE: FPGA IMPLEMENTATION OF A 64-TAP FIR FILTER USING RADIX-8 BOOTH MULTIPLIER IN VERILOG

Authors: Sowmya Nallapati, Sreejeesh S G, Nanditha N Varma and Shoukath Cherukat

Abstract: This paper presents the FPGA implementation of a 64-tap finite impulse response (FIR) filter utilizing a Radix-8 Booth multiplier to achieve efficient multiplication and high-speed operation. The design is described in Verilog HDL and implemented on a Xilinx Artix-7 FPGA (xc7a100tcsg324-1) using the Nexys A7-100T development board, with synthesis and implementation carried out in Vivado 2021.2. A fixed- point Q1.15 format is employed to balance computational accuracy and hardware complexity. The architecture is evaluated in terms of resource utilization and operating frequency, demonstrating its suitability for real-time digital signal processing applications on FPGA platforms.

Keywords: FIR filter, Radix-8 Booth multiplier, FPGA, Verilog HDL, Nexys A7-100T

Paper ID: 93, TITLE: FPGA Implementation of Vehicle Emission Monitoring and Alert System

Authors: Vishnu Hari, Nanditha N Varma and Sreejeesh S G

Abstract: This paper presents a comprehensive FPGA-based vehicle emission monitoring and alert system, designed and implemented using Verilog HDL on a Xilinx Artix-7 FPGA (XC7A100TCSG324-1) via the Arty A7-35T development board. The system simulates real-time detection of pollutants—Carbon Monoxide (CO), Carbon Dioxide (CO₂), Sulfur

Dioxide (SO₂), and Particulate Matter (PM_{2.5})—using 10-bit Analog-to-Digital Converter (ADC) inputs generated by Vivado’s Virtual Input/Output (VIO) core, eliminating the need for physical sensors during prototyping. Integer-based fixed-point arithmetic scales ADC values into percentage or parts-per-million (ppm) concentrations, which are compared against predefined thresholds (e.g., CO $\leq$ 20%, PM_{2.5} $\leq$ 100 $\mu\text{g}/\text{m}^3$) to trigger alerts displayed on a 16x2 LCD. The design exploits FPGA parallelism for low-latency processing, validated in real-time using the Integrated Logic Analyzer (ILA). Performance metrics reveal a power consumption of 0.077 W, utilization of 2050 Look-Up Tables (LUTs) and 2781 Flip-Flops (FFs), and a maximum operating frequency of 100 MHz. This scalable prototype addresses gaps in continuous emission monitoring, offering a foundation for future integration with physical sensors, IoT connectivity, and advanced analytics.

Keywords: Vehicle emission monitoring, FPGA, Verilog HDL, ADC simulation, Real-time alerting, Basys 3, Environmental sensing.

Paper ID: 94, TITLE: AI-IoT Integrated Smart Solar Energy Forecasting and Optimization System.

Authors: Viswanath Naik Sugali and Aravind Kumar Madam

Abstract: Solar energy is a sustainable alternative to meet the rising global energy demand; however, its efficiency is strongly affected by environmental variations and system performance. This study proposes a hybrid Artificial Intelligence–Internet of Things (AI–IoT) framework for real-time monitoring, prediction, and optimization of solar power generation. The framework integrates AI-based predictive modeling for estimating DC power and efficiency under varying irradiation and temperature conditions with an IoT-enabled cloud platform for data acquisition, visualization, and remote monitoring. A digital twin is implemented using ThingSpeak to enable real-time tracking of voltage, current, temperature, and power parameters. The synergistic AI–IoT integration enhances decision-making for early performance degradation detection, enabling preventive maintenance and improving overall energy yield.

Keywords: AI–IoT, Solar energy, Power prediction, Cloud-based monitoring, Random Forest, ThingSpeak

Paper ID: 96, TITLE: Hybrid Transformer Neural Machine Translation with Gated Multi-Scale CNN Encoding

Authors: Vaishnavi Pandey and Neeraj Kumar

Abstract: This paper presents a Hybrid Transformer architecture for Neural Machine Translation (NMT) enhanced with Gated Multi-Scale Convolutional Neural Network (GMSCNN) encoding. Building upon the foundational Transformer model by Vaswani et al. [1], the proposed framework integrates localized convolutional context modeling within the encoder to capture morphological, syntactic, and phrase-level dependencies often overlooked by standard self-attention mechanisms. The GMSCNN module introduces hierarchical receptive fields through gated convolutions, enabling the encoder to extract multi-scale linguistic patterns while maintaining global contextual awareness. Comprehensive experiments conducted on the AI4Bharat Samanantar English–Hindi corpus demonstrate substantial improvements over the baseline Transformer and CNN-augmented variants. The proposed hybrid model achieves BLEU = 19.53, METEOR = 39.31, and TER = 71.66, surpassing all previous baselines. These results validate the effectiveness of combining multi-scale convolutional encoding with self-attention and semantic regularization. Moreover, the incorporation of gated feature fusion enhances model stability and adaptability across variable linguistic contexts, particularly in handling complex morphology and flexible word order. The study further establishes that GMSCNN-driven encoders significantly reduce overfitting and improve generalization to unseen sentence structures. Overall, the proposed Gated Multi-Scale Hybrid Transformer demonstrates strong potential as a robust, efficient, and linguistically informed framework for low-resource and morphologically rich translation tasks.

Keywords: Neural Machine Translation, Transformer, Multi-Scale CNN, Hybrid Architecture

Paper ID: 97, TITLE: Deep Learning Alternatives to Error Backpropagation: A Review

Authors: Jasbir Singh and Dr. Muneer Ahmad Dar

Abstract: Error Back Propagation have become the dominant training method for deep neural networks, but it is counter-intuitive to the way biological mind works (biological implausibility) and requires substantial compute resources, so much so that the ownership of adequately trained large language models have become the domain of a few resource rich organizations. This review examines the current trends in the research into alternatives to deep learning, such as biologically-inspired approaches, local learning rules, and novel optimization strategies. The author surveys key advancements mostly from 2020 onwards, discussing the promising approaches such as Forward-Forward algorithms, Hebbian Learning, Equilibrium Propagation, and Predictive Coding Frameworks. The error Back-Propagation (eBP) is currently the most successful approach to train deep networks and the alternatives are only chasing accuracies achieved by this method. All major AI models use Deep Learning with eBP and this more-is-more approach has effected alternative forms to AI research [1]. Nevertheless, if the alternative methods begin to approach benchmarks set by eBP, a few percentage points drop in accuracy may be acceptable provided the training is possible at a fraction of the compute cost of eBP. Such reduction in requirement for resources is most desirable and, in addition to being beneficial for developers, users and environment, shall democratise the Artificial Intelligence ecosystem.

Keywords: Backpropagation, Deep Learning, Hebbian Learning, Equilibrium Propagation, Predictive Coding, Forward Forward, Direct Feedback Alignment, Alternatives

Paper ID: 98, TITLE: Classification of Brain Tumor using Various Machine Learning and Deep Learning Techniques: A Comprehensive Analysis Survey

Authors: Dharmendra Kumar Mishra, Ghanshyam Mishra and Bihari Nandan Pandey

Abstract: Brain tumor must be accurately and promptly categorised in order for treatment to be planned correctly and for patients to have better outcomes. The usual way to diagnose something is to manually interpret Magnetic Resonance Imaging (MRI) data, which can take a lot of time and lead to differences between observers. The paper carefully looks at deep learning (DL) and machine learning (ML) methods for automatically sorting brain tumor into different groups. We investigate a variety of techniques, including conventional classical machine learning models such as Support Vector Machines (SVM) and advanced deep learning architectures, such as Convolutional Neural Networks (CNNs) and transfer learning models like ResNet50 and VGG16. The classification pipeline's main steps are

looked at in this study. Hybrid models and explainable AI (XAI) have the potential to foster trust and integration in clinical settings, among other potential future paths discussed in this study. Common challenges discussed include an imbalance in the distribution of classes and an absence of datasets. Data shows that deep learning models, especially transfer learning models, perform well, typically with accuracy above 95%. This suggests they could alter neuro-oncological diagnosis

Keywords: Support Vector Machine (SVM), Transfer Learning, MRI

Paper ID: 102, TITLE: Enhancing Prostate Cancer Imaging Datasets through DCGAN-Based Augmentation

Authors: Sumindar Kaur Saini, Mamta Juneja, Naveen Aggarwal and Nitin Pandey

Abstract: The machine learning is being extensively used for clinical decision-making which has intensified the requirement for extensive, diverse, and expertly labeled medical imaging datasets. But, assembling such datasets is still a major obstacle, because of the strict privacy regulations as well as the considerable time and domain knowledge needed for accurate annotation. Such limitations are actually accelerating interest in synthetic data generation as a practical way to broaden dataset diversity along with the enhancements in the generalization, and minimization of the model overfitting. Data augmentation stands out as a reliable strategy in this direction, as it creates plausible variations of existing medical images and exposes learning algorithms to a wider spectrum of training scenarios. When applied effectively, augmentation contributes to more stable, resilient, and accurate predictive models. In this study, we investigate multiple deep learning-based augmentation paradigms specifically designed for medical imaging tasks. For the production of the synthetic prostate cancer MRI scans, there was utilization of a Deep Convolutional Generative Adversarial Network (DCGAN). It integrated the convolutional components in both the generator and discriminator networks, along with generator which was driven using a 100-dimensional noise vector for synthesizing the newer image samples. The performance of the model was assessed using 10 randomly chosen outputs which were at intervals of 50 epochs. Training process displayed periodic variations, however the overall trend indicated better and gradual refinement. The best perceptual quality was taken to be at epoch 2000, and the model achieved the value of PSNR as 16.44 dB and the value of SSIM as 0.21, showing steady overall improvement despite occasional fluctuations.

Keywords: Deep Learning, Data Augmentation, Prostate Cancer, Medical Imaging, GANs

Paper ID: 103, TITLE: Design and Evaluation of a DID-Based Accountability Framework for Resource-Constrained IoT Devices

Authors: Lovnish Verma, Anita Budhiraja and Sarwan Singh

Abstract: An IoT architecture is proposed in this paper that focuses on accountability by linking device actions to cryptographic identities instead of using a central logging service as the means of storing information about all devices. The method uses different systems to verify device action quickly and for long term storage. Signing statements describing device action are verified separately from their storage on the blockchain by employing off-chain signature verification. The only data written to the blockchain is the root of Merkle Trees created for batch signed statements. This decreases transaction gas fees and storage requirements as there is less data to store but allows verification of previous actions without revealing complete signed payloads. Every device signs a brief statement concerning its activity, and the signed statements are combined to form Merkle Trees, and only root hashes of these trees are stored on-chain, thus reducing transaction gas fees and storage requirements. A prototype system that employs multiple ESP32 Microcontrollers, the MQTT protocol for communications, and Ethereum Smart Contracts have been developed that shows that the overall operation of the proposed IoT architecture is feasible: sub-500 ms verification latency and ~5.6 seconds for settlement. When batch anchoring is employed, the gas fee charged to each device action is reduced by ~95-99%, thus making it practical for deployment in resource-constrained environments. Gas measurements demonstrate that because of batching, per device action fees decrease by two orders of magnitude, thus making the technology realistic for resource-constrained devices and large-scale IoT deployments. Hardware and simulated experiments: A 20-node hardware testbed combined with a simulation of approximately 10,000 devices shows that the system supports stable throughput and therefore can support high-density IoT deployments whilst still providing non-repudiation and tamper-evident audit trails.

Keywords: IoT accountability, decentralized identifiers (DID), device action attestation, off-chain verification, Merkle tree batching, blockchain anchoring, resource-constrained IoT, non-repudiation, auditability, scalability

Paper ID: 105, TITLE: Comprehensive Performance Evaluation of Ollama-Based Large Language Models on Heterogeneous Edge Devices

Authors: Ankit Kumar, Suresh Kumar Gaddi, Amit Kumar Behera and Sunil Kumar

Abstract: Implementing and Deploying the large language models on edge computing devices is essential for low-latency and secure AI in resource constrained settings. This paper evaluates six Ollama-based LLMs—TinyLLaMA, microsoft based LLM Phi-3, Mistral, Qwen:0.5, Llama 3.2:1B, and Google based LLM Gemma2:2B—on three edge computing embedded and IoT Based hardware platforms: Raspberry Pi 4, Raspberry Pi 5, and NVIDIA Jetson Nano. We judge them on runtime, memory utilization, computational complexity, and efficiency using BLEU4 and ROUGE-L scores. Findings show significant performance differences across platforms. Raspberry Pi 5 runs models 3.2 times faster than Pi 4; for example, Mistral LLM completed math operations in 41.87 seconds on Pi 4 but was significantly faster on Pi 5. Model performance on edge computing devices varies notably with task type and hardware. Qwen 0.5B reacts best for coding tasks, achieving semantic accuracy of 0.55–0.58 with 2.4–4.8s inference on Raspberry Pi 4 while Gemma2 2B excelled in math (0.56–0.67) but had high latency (up to 66.8 s on Pi 5). TinyLLaMA remained efficient yet not much accurate, while Phi3 of microsoft showed platform-dependent results. LLaMA3.2:1B offered moderate quality but required 83–97 s, limiting usability. Among devices, Raspberry Pi 5 offered the best speed–accuracy balance, Pi 4 suited smaller models, and Jetson Nano delivered superior power efficiency within memory limits. In realworld tests, devices generated math, coding, and educational outputs offline within 2–7 s, demonstrating that optimized LLMs can run effectively on low-cost, resource-limited edge platforms for practical AI deployment.

Keywords: Edge Computing, LLMs Ollama, Framework, Raspberry Pi, Jetson Nano, Model Quantization, BLEU-4, ROUGE-L

Paper ID: 106, TITLE: AI-Driven Crop Recommendation for Sustainable Agriculture in Mizoram: A Machine Learning Approach

Authors: Vanlal Ruata and Chawngthu Zoremsanga

Abstract: The wide agro-climatic variation across Mizoram makes agricultural planning particularly difficult, often resulting in unsuitable crop choices which lower crop productivity. Because of this, a locally grounded and data-driven recommendation system is crucial to advance sustainable agriculture in the region. In this study, we design and evaluate an AI-based crop recommendation model created specifically for Mizoram's conditions. A key strength of the model lies in its use of a newly prepared region-focused data set. This is achieved by modifying the publicly available Kaggle "Crop Recommendation" data, which contain soil measurements such as N, P, K, pH, rainfall, temperature humidity along with their equivalent suitable crops. To make use of this dataset we collect temperature, rainfall and humidity dataset district-wise of from Mizoram official meteorological database which is published by the State Government. The entry of Kaggle data which have similar range of temperature, humidity and rainfall were retained and the other are discarded. This ensure the datasets matches the agro-climatic condition of Mizoram. Four machine learning models: XGBoost, Random Forest (RF), Artificial Neural Network (ANN), and K-Nearest Neighbor (K-NN) were trained and validated using 80% as training dataset and 20% as validation. The XGBoost model ended up performing the best, reaching about 85% accuracy, which was higher than the other methods. Because of that, we used XGBoost for making the district-wise crop recommendations. The finding suggest a climate-filtered dataset using XGBoost model can work as a practical tool for agricultural crop decisions. This kind of system can help push more sustainable planning, improve local food security, and give farmers a clearer idea of which crops fits better in different districts

Keywords: Crop Recommendation, Mizoram, Sustainable Agriculture, Machine Learning, XGBoost, Precision Agriculture, Data Filtering

Paper ID: 108, TITLE: Design of Analog Power Line filter for sensitive Equipment

Authors: Meesala Joshita, Maddula Sreeja, Chamundeshwari Yarnalle, Anand N and Jayaraj U. Kidav

Abstract: Now a days, almost every electronic device depends on a clean and stable power supply. However, power lines often carry unwanted noise that can disturb the performance of sensitive equipment. Our project aims to design an analog power line filter that helps remove this unwanted noise and provide a smoother, more reliable power signal. Our filter

is built using simple electronic components like resistors, capacitors, and operational amplifiers. It works by blocking or reducing the noise signals especially those caused by fluctuations, harmonics, or electromagnetic interference while allowing the useful part of the power signal to pass through. The design focuses on being cost-effective, practical, and easy to implement for real-world use. Through testing and simulation, our circuit proved to significantly reduce power line noise, improving the performance of devices that need stable voltage, such as medical instruments, audio systems, and other precision electronics. Overall, this project shows how a straightforward analog approach can make a big difference in maintaining power quality and protecting delicate equipment.

Keywords: Twin T Notch filter, Operational Amplifier, Power Filter Noise, Sensitive Equipment, Rail to Rail, Buffer

Paper ID: 109, TITLE: Design of a Low-Power Operational Amplifier for Wearable Biomedical Devices

Authors: Narendra Laveti, Meesala Joshita, Uday Kiran Guguloth, Anand N and Jayaraj U. Kidav

Abstract: The design of an low-power operational amplifier for wearable biomedical devices is presented in this paper. In order to achieve 19.8nW power consumption at a 0.6V supply, 58.2dB DC gain, and an 8.7kHz gain-bandwidth product, we designed a two-stage amplifier in 90nm CMOS technology that functions in the sub-threshold region. With an optimized bias distribution and a methodical application of the gm/ID design methodology, our approach achieves good power efficiency with a figure-of-merit of 2.19 kHz·pF/nW. Characterization across corners (-20°C to 60°C) show a stable operation across process variations and 8.2 mV 3σ input offset voltage. The amplifier's suitability for ECG, EEG, and EMG acquisition power constrained wearable devices is confirmed by the measured 42uVrms input-referred noise (0.5-100Hz) and 72dB CMRR.

Keywords: CMOS, operational amplifier, sub-threshold, ultra-low-power, biomedical, wearable devices, gm/ID, analog front-end, bio-potentials, 90nm CMOS

Paper ID: 112, TITLE: Harvesting the Potential of Robotics Process Automation Tools and Techniques for Automating User-Specific Document Extraction and Automated Personalized Mail Dispatch via UiPath

Authors: Shalinee Mishra, Sandeep Pati Tripathi, Abhinav Mishra and Dr. D.K. Mishra

Abstract: In the age of the ever-expanding landscape of digital transformation, the greatest quantities of organizations within all the sectors are embracing Robotic Process Automation (RPA) in a bid to have operational efficiency, accuracy, ROI and scalability. In this paper, the use of the automation will be made, applicability of the RPA tools and methods, especially with the use of UiPath, to automate the process of extracting user-specific data out of documents and incorporate personalized dispatch processes of email without human interference, Manual process includes extraction of data from document then maintaining data in any file after that sending email to each individual with specific attachment often involve extensive manual effort, leading to delays, inconsistencies, and human error. To address such type of challenges, an automation framework using Robotics Process Automation is designed that uses different activities of UiPath like Document Understanding, AI Center, and SMTP Mail message features to create a seamless process without any human intervention. The suggested automation is the intelligent document extraction (machine learning-based models and Optical Character Recognition (OCR) technologies) of the various types of documents (scanned PDFs, invoices, forms, and reports) as an intelligent system. After extraction, data is then classified, validated and stored in structured formats such as Excel or databases. The procedure of automation also spreads to the production and sending of personalized emails, during which every reader gets a dynamically personalized message with their corresponding document or information. The system uses UiPath Studio, Orchestrator and outlook/SMTP integration to schedule, execute and monitor these automated workflows. The methodology will reduce the number of people involved thereby minimizing the processing time, and it will be more accurate and consistent with the organizational policies. The RPA-based workflow should be enhanced with the adoption of the AI-supported decision-making. demonstrates how automation can supersede the rule-based functioning and offer contextual and user-oriented results. The study notes the collaboration of RPA, AI, and Natural Language Processing (NLP) as one of the ways of achieving cognitive automation and is a scalable model which can be implemented by enterprises, government agencies and even educational institutions. Overall, the project illustrates the way it is possible to exploit the

potential of RPA in document processing and communication. processes can lead to the realization of the significant degree of advancement of productivity, data correctness, user interface, etc. and digital governance.

Keywords: Robotic Process Automation (RPA), UiPath, Document Extraction, Email, AI Integration, Automation

Paper ID: 114, TITLE: Design and Analysis of Cascaded Level Shifter for High Speed and Low Power Applications

Authors: Jaanhvi Srivastava, Km Ankita Tripathi, Abhay Pratap Singh and Arjesh Jha

Abstract: In this work, a cascaded voltage level shifter (VLS) architecture that is optimized for low-power and high-speed operation in contemporary multi-voltage VLSI systems is presented. When used in subthreshold or near-threshold voltage settings, conventional level shifters—such as cross-coupled and current-mirror-based designs—have issues with contention current, static power dissipation, and worse transition performance. By adding more isolation transistors between the pull-down network and output nodes, the suggested cascaded topology successfully lowers short-circuit current and minimizes switching latency. Cadence Virtuoso using 45 nm CMOS technology is used to design and simulate the circuit. A comparative examination reveals a significant increase in propagation speed and power efficiency while maintaining full-swing output functioning. To assess noise immunity, hysteresis width analysis is also carried out. Because of its exceptional energy economy and resilience, the suggested design is appropriate for system-on-chip (SoC) and low-voltage, high-performance VLSI applications.

Keywords: Cascaded level shifter, subthreshold operation, low-power design, high-speed circuits, hysteresis width, noise immunity, Cadence Virtuoso, CMOS 45nm, multi-voltage interface

Paper ID: 115, TITLE: HYBRID LOG INTRUSION DETECTION: COMBINING ANOMALY DETECTION WITH SNORT SIGNATURES FOR HOST SECURITY

Authors: Prashant Kumar Tripathi, Abhinav Mishra, Ajay Verma and Dr. D. K. Mishra

Abstract: In this paper, we present a hybrid log-based intrusion detection system (IDS) implemented in Python that combines anomaly-based and signature-based techniques to enhance host security. The objective is to leverage the complementary strengths of anomaly detection (for novel threats) and signature detection (for known threats) to improve detection coverage and accuracy. The system leverages machine learning algorithms to model normal log behavior and detects anomalies, and integrates the Snort (open-source IDS) signature engine to catch known attack. This synergy between anomaly detection and signature analysis aims to cover both zero-day attacks and known exploits, mitigating the limitations of each approach alone. We evaluated the hybrid IDS on public intrusion detection benchmark datasets (such as the KDD Cup 99 dataset) to validate its effectiveness. Experimental results demonstrate notable performance improvements: the combined approach achieves higher detection rates and a lower false positive rate compared to standalone anomaly or signature. These findings show that our Python-based hybrid IDS can significantly improve threat detection and reduce false alarms, underscoring the benefits of merging machine learning-driven anomaly detection with Snort-based signature analysis for host intrusion detection.

Keywords: Anomaly detection, Host-based intrusion detection, Hybrid intrusion detection, Machine learning, Real-time intrusion detection, Snort signatures

Paper ID: 118, TITLE: Automated Stroke Detection via Multihead Attention U-Net for Lesion Segmentation

Authors: Deepika, Atam Prakash Bajpai, Mritunjay Rai, Abhishek Kumar Saxena and Ravi Rastogi

Abstract: Proper and timely assessment of stroke severity is an important step in making clinical decisions and enhancing patient outcomes. Quick diagnosis helps clinicians examine the severity of neurological impairment and make the most suitable intervention promptly. In response to this demand, this paper will design a Multi-head Attention U-Net (MA-UNet) network capable of completely automating the effort of handling stroke-severity prediction at a high degree of accuracy and at a reasonable computational cost. The MA-U Net is a variant of the traditional U-Net network that consists of a multi-head attention unit that attends to the most informative parts of medical images. The mechanism lets the model emphasize stroke-affected areas and not treat all of them the same. The

attention module boosts the feature extraction and lesion delineation by improving the network in the detection of small lesions, significantly improving the effectiveness of classification. The proposed model has a high potential as evidenced by the outcomes of the experiments. With just four training epochs, the MA-U Net obtained a validation loss of 0.00138 and the accuracy of its validation of 99.67 %, which is rapid convergence and predictive success. The sophisticated attentive representation feature was one of the pivotal parts in enabling the model in identifying normal tissue and the affected tissue with high level of certitude. On the whole, the results can point to the possibilities of MA-U Net, if it can be a reliable computational resource that can help clinicians in the diagnosis of stroke. The model helps in intervening faster and managing the patients better since the available tests are fast, accurate, and automated. Since stroke is one of the major health issues worldwide, such optimizations as regards the analysis of medical images can have an enormous positive effect on the analysis process and reinforce clinical decisions.

Keywords: Stroke, MA-UNet, Brain Tumour, Deep Learning, Machine Learning

Paper ID: 124, TITLE: Optimization of TiO₂/PCBM bilayer ETLs for enhanced photovoltaic Efficiency

Authors: Aastha Shukla, Shivangi Dwivedi, Arjesh Jha and S.C Agrawal

Abstract: The analysis focuses on optimizing perovskite solar cell performance by introducing a novel bilayer electron transport layer composed of TiO₂ and PCBM. In contrast to conventional single-layer ETLs, the combination of these materials aids in charge transport while reducing recombination losses. A set of physics-based simulations were completed to study the role of layer thickness on the overall device performance. The simulation results showed that a structure with 100nm of TiO₂ & 20nm of PCBM performs best, providing faster electron transport while subsequently lowering charge losses in the device. In favoring environmental sustainability, the light absorbing layer is composed of CsSnI₃, a lead-free perovskite material. The optimized device demonstrated a high-power conversion efficiency of approximately 24.70% showing a good capacity of converting sunlight into electricity. This design improves electronic performance along with developing environmentally friendly solar energy technology. The results confirm that bilayer ETL structures provide an improved performance advantage over monolayer ETL structures in perovskite solar cell but also demonstrate the capabilities of simulation as a

simple methodology for testing & optimizing multilayer solar cell architecture, promoting assessments, development & optimization of high-performance & green photovoltaic technology.

Keywords: SCAPS-1D Software, Perovskite Solar Cell, Bilayer ETL, CsSnI₃

Paper ID: 125, TITLE: GPS and Torque-Sensor based Embedded Turn Indicator System for Enhanced Vehicle Safety

Authors: Vigneshwar S K, Shoukath Cherukat and Ambili C

Abstract: This paper presents the design and implementation of smart indicator (software - hardware) control unit that integrates the GPS Receiver co-ordinate data and Steering Wheel torque sensor inputs. This control provides decision-based turn indicator control and driving assistance in both autonomous and manual driving modes. In Autonomous driving mode, where vehicle is under software-based control, manual making of turn indicator signal is not suitable. So, the proposed system will activate the corresponding turn indicators as the vehicle approaches the turning point by using real - time GPS coordinate data and navigation guidance data from the map application. In Manual driving mode, the system functions as a driving - assistance unit, which controls the turn indicators by analyzing steering torque variations. By making navigation based embedded control approach, the system will enhance over-all driving safety, reduces accidents by incorrect or missed indicator use, and supports Autonomous mode vehicle systems.

Keywords: Turn Indicator, Autonomous Driving, GPS, Torque Sensor, ADAS, Embedded Control, IMU, Navigation

Paper ID: 127, TITLE: Review Paper: Detection and Mitigation of Deep fakes and AI-Generated Media

Authors: Wormila Ronra Shimray, Mashunyui Z Shimray, Asset A S Zimik, Pamleiphy R Shimray and Usham Sanjota Chanu

Abstract: The rapid advancement of generative artificial intelligence (AI) has resulted in an unprecedented increase in the use of “deep fakes,” highly realistic manipulation of images, videos, and audio content generated by techniques such as Generative Adversarial

Networks (GANs), Variational Autoencoders (VAEs), and Diffusion Models. While deepfakes have the potential to bring numerous benefits to areas such as entertainment, education, accessibility, and health care, there are many potential risks associated with them, including, but not limited to, spreading misinformation or propaganda, identity theft, sabotaging elections and other government processes, creating unwanted pornography without consent, and reducing the public's faith in digital evidence. This literature review synthesizes the findings from 39 studies on various aspects of deepfakes, including survey research, experiments, forensic methods, and sociotechnical analyses of both the creation and detection of deepfakes. The main five categories of strategies for detecting deepfakes are: Physiological signal analysis (e.g. eye blinking, inconsistencies in the head pose, lip sync errors etc.). Image and Video Forensic Analysis (e.g. distortions caused by warping, residual noise, and background clues) Deep Learning-Based Detection Techniques (e.g. Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Optical Flow Based Networks and Hybrid Architectures). Hybrid Frameworks and Tool Kits. Human-Centered Detection Techniques, emphasizing the limitations of Human Perception. This review evaluates several benchmark data sets used to develop detection research, including DFDC, Celeb-DF, Face Forensics++, DF-Wild, and Deepfake TIMIT. Additionally, this review addresses topics of importance to developing resilience against the increasing threat of deep fakes, including, but not limited to, the challenges of achieving Adversarial Robustness, Computational Efficiency, Generalization Gaps, and Dataset Bias. Lastly, the review identifies some of the remaining open problems and possible avenues for future research in multimodal detection, Explainable AI, Lightweight Real-Time Systems, and Regulatory Frameworks.

Keywords: Deepfake Detection, AI-Generated Images, Image Forensics, Convolutional Neural Networks (CNNs), Generative Adversarial Networks (GANs), Synthetic Media, Digital Image Authentication

Paper ID: 133, TITLE: Exploring Students' Learning Performance with ChatGPT Based Learning

Authors: Dr Muneer Ahmad Dar, Mansub Bhat, Sakshi Parashar, Sadiya Rashid and Sameer Ahmad Bhat

Abstract: Visual e-learning has evolved as an important component in the education system, contributing interactive, interesting, and engaging methods that improve student comprehension. However, the comparative efficacy and productiveness of visual and traditional e-learning techniques remain unexplored. Current e-learning systems are generally deprived of adaptive, conversational instructional guidance to endure and maintain learner participation. This study is the comparative research study of a Chatbot-based visual e-learning system that improves student performance and retention of concepts to the traditional e-learning system learning. The total of 111 participants were divided into two group, and data were analyzed using the F -test ($F = 1.10$, $p = 0.73$) and Welch's t -test ($t = 4.67$, $p < 0.001$). Results exhibited significantly higher mean scores for the visual group ($M = 37.25$, $SD = 7.86$) as compared to the traditional group ($M = 30.44$, $SD = 7.49$), with a large effect size (Cohen's $d = 0.89$). The results and findings confirm that Chatbot-assisted visual e-learning significantly improves engagement, concept retention, and learning outcomes, promoting and encouraging its use in digital education systems.

Keywords: Chatbot, Learning resource, Educational resource, Learning Performance

Paper ID: 134, TITLE: REINFORCEMENT LEARNING-BASED FRAMEWORK FOR CYBERSECURITY IN ONLINE EXAMINATION SYSTEMS

Authors: Anurag Shah, Sarika Jain and Manoj Kumar

Abstract: As cybersecurity threats are becoming more and more complex, sophisticated and persistent, the methods of traditional defence mechanism are becoming obsolete and are struggling hard in keeping pace cost-effectively to preventing the black swan [1] threats of the today's cyberworld, that are poised with the advent of Artificial Intelligence, hence need is being felt for the adaptive capabilities of the cybersecurity tools along with the dynamic decision-making abilities to mitigate the ever evolving cybersecurity risks associated not only in the cyberworld but also with the online examination systems being used today in every step of the learning process as well as the shortlisting process of any institute/organisation. Machine Learning (ML) must be used to counter the attacks on the system today, as the same are increasing exponentially day by day. For this, Reinforcement Learning (RL), which is a powerful subset of ML, must be effectively

used to create strategies in dynamic environments with varied hardware and software in different scenarios to effectively detect and control the ever-evolving cybersecurity risks and threats while effectively addressing the fatigue in manual processes and providing real-time decision-making for the stakeholders. In this paper, we are investigating extensively the application of RL techniques to provide adaptive decision-making processes by enabling systems with proactive decision-making in real-time changing threat scenarios. This paper evaluates the present state-of-the-art RL-based methods, while highlighting their strengths and weaknesses, and it also identifies the areas that require further improvements to propose a novel RL-based cybersecurity framework tailored to the specific demands of online examination platforms.

Keywords: Cybersecurity, Reinforcement Learning, Online Examination, Intrusion Detection, Adaptive Defence, Zero-Day Attack

Paper ID: 135, TITLE: Dragonfly: A Lightweight Offline Antivirus System for Executable Malware Detection Using Machine Learning

Authors: Heisnam Bidyaluxmi Devi, Sarungbam Usharani Devi, Thongam Bobo and Usham Sanjota Chanu

Abstract: Antivirus products often depend on signatures and fixed heuristics, which struggle with fast changing malware on end-user desktops. Dragonfly is a Windows-focused, fully offline antivirus that trains in Python but deploys a native C# classifier with an Electron interface and a file-watcher for real-time scanning on user machines without network dependence. The system extracts Windows API import features from PE files, applies SMOTE balancing and SelectKBest with χ^2 (chi squared), and evaluates Logistic Regression, Random Forest, XGBoost, and LightGBM via 5-fold cross-validation, selecting a Random Forest for deployability and latency on ML.NET. On a held-out test set, the Random Forest achieved accuracy 87% and F1 89%, while XGBoost yielded higher F1 but was not chosen due to deployment constraints; the native C# reimplementation preserved test-set behavior and reduced per-file prediction latency compared to Python subprocess inference on an Intel i5/16GB Windows 11 system. Dragonfly demonstrates that an offline, privacy-preserving desktop antivirus can deliver competitive static

detection with practical throughput via modular IPC between the UI, watcher, and classifier, while remaining extensible to future dynamic features.

Keywords: Antivirus System, C# executables, Electron application, Machine Learning, Offline malware detection, Window API behavior

Paper ID: 138, TITLE: Non-invasive Classification of Lung Diseases using PCA-Enhanced Deep Learning on GC-MS Breathomics

Authors: Khuraijam Gunindro, Usham Sanjota Chanu and Angom Buboo Singh

Abstract: Breathomics, especially gas chromatography–mass spectrometry (GC-MS), is a promising way to diagnose lung diseases without invasive methods. GC-MS data is complex which makes it hard to classify. In this study, we used a deep learning method with principal component analysis (PCA) and a multilayer perceptron (MLP) to classify asthma, bronchiectasis, and chronic obstructive pulmonary disease (COPD) from breath samples. We used data from 121 people with 173 different volatile compounds. The data was processed and simplified into feature vectors for each person. PCA was used to make the data less complex. Also, an MLP with three layers, Layer-Normalization, and ReLU activations was used for classification. Then, Using stratified 5-fold cross-validation and a separate test set, the model achieved an average accuracy of 98.9% in cross-validation and 96.0% in the test set (F1-score: 0.959, Cohen’s κ : 0.938). These results show that PCA-enhanced deep learning can reliably diagnose lung diseases without invasive methods.

Keywords: Breathomics, Deep learning, GC-MS, Lung disease, Multilayer perceptron, PCA

Paper ID: 141, TITLE: A study of Data Augmentation in Low-Resource Training

Authors: Thimtha Ruwndar, Yarmaya L.W, Daniel Moirangthem Singh, Ralngam Seltun and Yumnam Jayanta Singh

Abstract: Many real-world applications for image classification cannot afford to collect and label large datasets. The need for expertise to label images adds to the expense and difficulty of developing these large datasets; as a result, many models that are trained using limited amounts of labeled data suffer from poor performance due to their inability to

generalize well to new, unseen data, and because the models are prone to overfitting to the limited amount of training data. These issues can be seen in several application domains including medical imaging, satellite imaging and industrial inspection where it is necessary to have expert knowledge to properly label images for machine learning model development. One method used to address the limitations associated with limited training data is to artificially expand the size of the training set via various transformation techniques that do not alter the label for the image. Many data augmentation techniques have been proposed in recent literature but there remains a significant lack of systematic studies of the effectiveness of each technique when the amount of available training data is extremely limited. Here, we perform a controlled evaluation of the impact of six different types of data augmentation (including RandAugment, Mixup, Cutmix) applied to the CIFAR-10 dataset at three different resource levels: very small (1%); small (5%); and moderately small (10%) subsets of the training data. For comparison purposes, we apply two different architectures to the CIFAR-10 test set; a lightweight CNN and a deeper ResNet-18.

Keywords: Data augmentation, Image classification, Geometric and color augmentations, MixUp, CutMix, RandAugment, ResNet-18, CNN

Paper ID: 143, TITLE: ARGCLIP: Anatomically-Regularized Graph Clustering for Structure-Aware Prediction in Lung CT Scans

Authors: Ekta Srivastava, Siddhant Ujjain, Tapan Kumar Gandhi and Sandeep Kumar

Abstract: Lung computed tomography (CT) provides rich three-dimensional views of pulmonary anatomy, yet grid-based deep networks can struggle with irregular microstructure, cross-lobe spillover, and weak calibration. We propose ARGCLIP (Anatomically-Regularized Graph Clustering for Lung Imaging Pipeline), which (i) partitions each volume into compact 3D supervoxels (e.g., $5 \times 5 \times 5$) with radiomic/texture descriptors inside the lung mask, (ii) builds a supervoxel graph and performs anatomy-regularized clustering guided by lobe and vessel priors, and (iii) trains a lightweight message-passing GNN on the coarsened cluster graph to predict nodule malignancy with region-level saliency. On the LIDC-IDRI cohort (1,010 subjects), using patient-level splits and S12 vs. S45 labeling (scores 1–2 vs. 4–5; score 3 excluded), ARGCLIP attains AUROC = 0.991 (95% CI: 0.989–0.993), Accuracy = 95.5%, Sensitivity = 95.8%,

Specificity = 95.2%, and improved calibration (ECE = 1.7%, Brier = 0.044). This outperforms strong published classifiers (e.g., NoduleX, R2MNet; AUROC 0.971–0.975) by +1.6 to +2.0 absolute AUROC points, and surpasses our best in-house models by +7.1 (vs. fine-graph GNN, AUROC 0.920) and +9.1 (vs. 3D CNN, AUROC 0.900) points. Qualitative overlays show high-saliency clusters aligning with radiologist-marked nodules while suppressing vessel-induced false positives. Overall, embedding anatomical priors into graph clustering yields more accurate, better-calibrated, and interpretable lung CT analysis than purely grid-or unconstrained graph-based alternatives.

Keywords: Lung CT, Supervoxels, Anatomical priors, Graph clustering, Graph neural networks, Malignancy classification, LIDC-IDRI, Explainable AI

Paper ID: 175, TITLE: Digital Skilling for the 21st Century Policy and Framework Approach for Developing Globally Competent Workforce

Authors: Priya Dongare Jadhav, Suhas Deshmukh, Kiran Bhole, Kedarnath Rane and Manish Kumar

Abstract: The growth of the Artificial Intelligence (AI), automation and advanced digital technologies are game changing for industry due to dynamic the skills requirements. This work represents the practical approach for the industry and academia to develop strategies that with help of the government initiatives. It builds mainly on the India's National Programme on AI (NPAI) Skilling Framework and compares the with aspects of the international models of European Union's DigComp 2.2 and Singapore's Skills Framework for the Digital Economy. The strategy is based on learner diversity of "AI for All, AI for Many, and AI for Few." It based on learning from the basic digital knowledge to advanced skills in AI. Key part of this is focusing on the AI enabled learning mechanisms that offers the custom model as per needs of market. Also, the reskilling toolkit can be introduced in the system based on the micro credentials, digital badges to ensure the security. The framework also focuses on the concept of the floating digital workforce eliminating geographical constraints. The comparison of the different models detailed about the focusing on the specific industry needs. The framework proposed by India as NPAI fills gap by focusing on inclusion of the AI skills and creating the credit transfer which is acceptable at different regions and countries.

By leading these efforts India is helping to build future tech ready skill force which is global-ly connected and trained.

Keywords: Digital Skilling, Sustainability, AI tools, Global Digital Skills Reference Framework

Paper ID: 177, TITLE: Design and Analysis of DG-DMG-DD-Heterojunction Tunnel Field Effect Transistor with GaSb Pocket.

Authors: Shivangi Dwivedi, Aastha Shukla and Anurag Govind Rao

Abstract: In this work, a Double Gate-Double Metal Gate-Dual Dielectric Heterojunction Tunnel Field Effect Transistor (DG-DMG-DD-HTFET) with a heavily doped GaSb pocket is analyzed. Silvaco TCAD is used to model and analyze the device. When compared to traditional structure, the n+ GaSb pocket greatly strengthens the Band-to-Band tunnelling (BTBT) process, increasing the ON-state current, improving the current ratio and lowering the Subthreshold Swing (SS). The dual-dielectric double gate design efficiently blocks leakage pathways while also increasing carrier transport efficiency. The Study also investigates the recombination rate, electric field distribution & total current density on the overall behavior of the device, as well as variations in GaSb composition. The results of the simulation confirm that the suggested design performs better, highlighting its appropriateness for high-performance and energy-efficient electronic applications.

Keywords: Band-to- Band Tunnelling (BTBT), Double Metal Gate (DMG), Heterojunction Tunnel Field-Effect Transistor (HTFET), GaSb pocket

Paper ID: 179, TITLE: Study and Comparison of Binary Number Representation and Computation in Indian Knowledge System versus Standard Modern System

Authors: Komal Asrani, Deepak Asrani and Manoj Kumar

Abstract: We are living in the age of digital revolution. Life can't be imagined without computers. Computing gadgets are used in one or the other forms in all spheres of daily life. Digitization has made life faster, easier and highly convenient by serving all kinds of our day to day needs at work place or at home, managing routine official tasks effectively. Now, the important question to address is that how all this has become a reality. To answer

this question, we have dived into the core of digitization. It is revealed that in the root of digitization lies the concept of binary system. Any content could be represented as a series of “zero” (0) and “one” (1). In this paper, we have tried to explore the inception of “zero” and “one”, its evolution and role in making computers the most powerful gadget. We have explored the number representation techniques and found that Maharishi Panini had introduced the concept of Guru and Laghu in Chandaḥśāstra to represent zero and one. We have also analysed the standard modern system of binary numbers. We have also tried to analyse computational algorithms of both the methods of conversion of numbers from binary to decimal and vice versa. Time and space complexity of both the methods is computed and compared to determine strength of both the methods.

Keywords: Binary system, Panini, decimal system, Guru, Laghu, computational complexity

Paper ID: 195, TITLE: Converging Realms: Integrating Biotechnology, Augmented Reality, Virtual Reality, and the Metaverse for Next-Generation Healthcare Innovations

Authors: Shameem Nahvi, Ashaq Hussain Dar and Vidya Arnav

Abstract: A profound shift is underway in modern medicine, driven by the convergence of biotechnology with immersive technologies like augmented reality, virtual reality, and the metaverse. This integration is poised to redefine medical training, surgical practice, therapeutic approaches, and rehabilitation, moving beyond incremental gains to enable truly personalised and accessible care. This paper explores the synergies between these fields and introduces the Biotech Immersive Metaverse Ecosystem (BIME), a novel framework for their unified application. We examine evidence of tangible benefits, including enhanced procedural accuracy and reduced patient anxiety, while also addressing critical challenges such as data privacy, ethical concerns, and equitable access. We conclude that a strategic and ethically guided implementation is paramount to harnessing this potential for building resilient, patient-centric health systems for the future.

Keywords: Augmented Reality, Bio-Digital Interface, Bioethics, Digital Therapeutics, Digital Twins, Healthcare Disruption, Health Equity, Immersive Learning, Metaverse, Personalised Genomics, Surgical Simulation, Telehealth, Virtual Reality

Paper ID: 197, TITLE: Strategic Imperatives for Digital Skilling: Advancing Proactive Skill Fluency for Global Technological Resilience

Authors: Shameem Nahvi, Rajneesh Raina and Vidya Arnav

Abstract: The current approach to digital skilling remains reactive, leaving the workforce chronically behind technological change. This paper introduces Proactive Skill Fluency (PSF)—a future-oriented model that emphasizes adaptive thinking, continuous learning, and ethical judgement over static skills. We outline the Tripartite Resilience Model (TRM), which integrates individual agility, organizational adaptability, and supportive policy ecosystems to strengthen long-term skill development. Despite widespread skill shortages, only a small share of learning programs build predictive, fluency-based capabilities. Illustrative cases—such as Henkel’s competency platform and Microsoft’s AI-focused apprenticeship loops—show significant improvements in workforce mobility and problem-solving capacity when PSF principles are applied. The paper also notes persistent barriers, including infrastructure gaps and resistance to new learning models, while identifying opportunities in AI-driven mentorship and collaborative data frameworks. For NICEDT-2026, adopting PSF is presented as essential for equitable growth and national technological resilience

Keywords: Adaptive Skilling Ecosystems, AI Ethics Literacy, Cognitive Agility, Digital Skilling, Lifelong Learning, Micro-credentialing, Organisational Plasticity, Proactive Skill Fluency(PSF), Technological Sovereignty, Tripartite Resilience Model(TRM)

Paper ID: 199, TITLE: Advances in Precision Rice Agriculture: A Systematic Review of Machine Learning and Deep Learning Driven Rice Farming Using UAV-Based Remote Sensing

Authors: Subrat Chetia

Abstract: Precision agriculture represents a paradigm shift in farming practices, utilizing advanced technologies to optimize resource utilization and enhance crop productivity. This systematic review examines the integration of machine learning (ML), deep learning (DL), and unmanned aerial vehicle (UAV) imaging for precision rice farming. The research systematically analyzes four critical objectives: weed segmentation in rice fields, seedling

detection and growth monitoring, crop coverage assessment, and prototype design for UAV-based rice crop monitoring systems. Through a comprehensive analysis of peer-reviewed publications from 2015-2024, we identify significant advancements in convolutional neural networks for weed identification, time-series UAV imagery for growth stage monitoring, multispectral analytics for crop coverage estimation, and integrated IoT-ML frameworks for yield prediction. This literature review highlights various research gaps exists in real-time processing capabilities, model transferability across diverse growing conditions, and cost-effective practical application strategies for cultivators. As climate change intensifies and global food security concerns growing day by day, this study aims to provides a critical framework to guide future research in precision rice farming.

Keywords: Precision Agriculture, AI, ML, DL, UAV, Rice Farming, Weed Segmentation, Crop Monitoring

Paper ID: 200, TITLE: BLE-Based Automatic Attendance Management System for Educational Institutions

Authors: Lakhimoni Gogoi, Kasturi Bordoloi, Anuj Kumar Shah, Nishanta Pratim Talukdar and Abhijit Gogoi

Abstract: Taking attendance in educational institute is a laborious task, and found to have flaws like human error associated with manual system of roll call and is also exposed to proxy marking. There are already some automated methods available, such as RFID, biometric and barcode based systems that demand specific hardware and incur a high installation or maintenance cost. In this paper a labour saving, smart and completely software-based attendance system over bluetooth low energy (BLE) using Android application integrated with ERP back-end is presented as a practical, low cost solution. In the suggested method, faculty and student are validated by their ERP accounts. The teacher logs in, and chooses his/her class for which he/she wants to take attendance (the system broadcasts a BLE signal for the chosen class). Students first select the class for which they wish to mark their presence and then scan for the corresponding broadcasted BLE signal. Only when the broadcast is detected within range is the student's attendance recorded, ensuring that attendance can be marked solely by students physically present near the teacher's device. All attendance records are automatically stored in the institutional

database and made available for real-time monitoring and reporting. The system is energy-efficient, hardware-independent, easy to deploy, and scalable, making it suitable for modern educational environments where minimizing infrastructure costs is essential.

Keywords: Bluetooth Low Energy, Attendance System, Proximity-Based Verification

Paper ID: 204, TITLE: A UNIFIED EDGE AI-EDA FRAMEWORK FOR RESPONSIVE IOT AND SMART HEALTHCARE APPLICATIONS

Authors: Ankit Jain, Anita Shukla and Imran Ullah Khan

Abstract: Digital companies are quickly progressing toward having systems that can analyze, determine, and take actions in real time. The merging of Edge Artificial Intelligence (AI) and Event-Driven Architecture is an important step toward that end. Edge AI allows analytics to be done at the location of the data created which means local analysis occurs in real time without the need for and dependency on cloud services. EDA can provide a high degree of responsiveness for enterprise business systems that are highly effective at supporting very fast-moving data in a high-density data stream with asynchronous interactions and real-time event processing. Together these provide a transformational synergy to rejuvenate how organizations are effective and responsive in their industry. Organizations can facilitate predictive automation, lower latency and greater scalability, all by integrating an AI inference model at the edge with Event-Driven Architecture (EDA). This empowers organizations in manufacturing, health care, finance and logistics to acquire actionable insights, exactly when and where needed. EDA also supports architectures that are resilient to persistent service continuity disruptions of the network. A full demonstration of the convergence of IoT, edge AI, and EDA would be a Smart Health Monitoring System based on IoT and Embedded used with an ESP32 microcontroller armed with the MAX30100 for heart rate and SpO₂ readings, and a DHT11 for temperature and humidity readings. Edge AI algorithms analyze the patient's live readings locally on the ESP32 microcontroller to detect anomalies while EDA sends instantaneous alerts to caregivers through cloud or mobile interfaces. A simple prototype healthcare application like this demonstrates how Edge AI and EDA together provide live, intelligent, and responsive health monitoring for enhanced safety and prevention.

Keywords: Edge AI, Event-Driven Architecture (EDA), Real-time responsiveness, IoT embedded healthcare, Predictive automation, Low-latency analytics, Edge-cloud synergy

Paper ID: 211, TITLE: An RPA-Driven Framework for Enhancing Social Media Analytics Through Real-Time Sentiment Analysis

Authors: Sandeep Pati Tripathi, Shalineer Mishra, Abhinav Mishra and Dr. Nishant Tripathi

Abstract: The volume of user-generated content on social media platforms has been growing exponentially, which has necessitated the need to utilize real-time sentiment analysis to aid the organizational decision-making process, brand management, crisis detection, and market intelligence. Although there have been improvements in the field of natural language processing (NLP) and machine learning, sentiment analysis (AA) is difficult to accomplish in an efficient, scalable, and automated fashion because of large amounts of data, unstructured data, natural language variations, and the inherent manual cost of data gathering and pre-processing. The paper suggests an end-to-end automation-based solution that considers the Robotic Process Automation (RPA) and sophisticated sentiment analysis models to improve the performance of social media analytics in terms of efficiency and scalability. UiPath Studio Enterprise is employed in the framework to automate the data extraction, cleaning, model calling, aggregation of results, and reporting. The main classifier in the pipeline is a lightweight open-source sentiment model (fastText-based, which is open-sourced by Facebook Research), packed as a project artifact. The model estimates five sentiment classes, including Very Negative, Negative, Neutral, Positive, and Very Positive and has a JSON response with the classes and the confidence score. Experimental results indicate that the pipeline facilitated by RPA is much more efficient in processing, reducing manual effort by 90 percent of generating most posts, and analyzing tens of thousands of posts per hour nearly in real time. The outcomes suggest that the combination of RPA and NLP is a beneficial direction towards the ongoing sentiment tracking and analytics of an enterprise level.

Keywords: Robotic Process Automation, Sentiment Analysis, Natural Language Processing, Automation Framework, Machine Learning

Paper ID: 222, TITLE: A Comparative Review of Long Short-Term Memory-Based Encoder–Decoder, Transformer, and Hybrid Architectures for Text Summarization

Authors: Tulsipriya Hanglem, Dr Takhellambam Sonamani Singh and Khundrakpam Veeshel Singh

Abstract: With uses ranging from news aggregation to academic literature condensation and document retrieval, text summarization has emerged as a crucial area of study within Natural Language Processing (NLP). With the LSTM-based encoder–decoder architecture providing a fundamental framework for abstractive summarization, deep learning has made significant strides in this field. Transformer-based architectures like BERT, T5, and GPT, which have recently emerged and outperformed LSTM models in terms of fluency and contextual comprehension, have further transformed the field. A comparison between LSTM-based encoder-decoder models and their Transformer-based and hybrid equivalents is presented in this paper. The study looks at methods, datasets, evaluation metrics, outcomes, and limitations using information from several IEEE and scholarly publications (2019–2025). According to the study, attention mechanisms and Transformer-based models help to overcome the difficulties that LSTM models have with long-term context and parallelization, even though they are good at capturing sequential dependencies. Hybridization, low-resource summarization, and increased factual accuracy are the main areas of future research.

Keywords: LSTM, transformer, encoder-decoder, text summarization.

Paper ID: 241, TITLE: A Comparative Review on Machine Learning and Deep Learning Techniques for Zero-Day Malwares and Ad-vanced Persistence Threats Identification

Authors: Pooja Sharma and Harjit Singh

Abstract: In the present times not even, a single day is elapsed when there is no cyber-attack or com-promise has been executed on any well recognized organizations and government agencies. There are number of attacks based on their modus operand. An advanced persistent threat (APT) is considered as deliberate and very complicated assault. Zero-day attacks exploit inaccessible weaknesses to avoid detection by safety software. While cyber danger pro-gresses, traditional safety measures are progressively insufficient,

underlining immediate requirement for sophisticated identity techniques. Recently, machine learning (ML) and deep learning (DL) have been employed majorly owing to its identification capabilities. This paper provides comparative reviews and analysis of ML and DL procedures to identify zero-day malware and APT. The evaluation of methods is conducted based on the type of technique further used in them, datasets considered, and accuracy obtained by methods. This paper also emphasizes the primary techniques employed to identify the attack according to their types. This review tries to inform researchers and cyber professionals about the current status of threatening technologies and direct future progress in this important domain.

Keywords: APT, Zero day, Threats, CNN, LSTM, ML, DL, GAN

Paper ID: 242, TITLE: Predicting Student Depression and Stress Using Multimodal Daily Behavior Data

Authors: Lalhminghlua Khiangte and Chhungpuia Renthlei

Abstract: This study investigates the feasibility of predicting depression, stress, and mood levels among college students using multimodal daily behavioral signals. The dataset includes PHQ-9 baseline and follow-up scores, daily steps, sleep duration, screen interaction time, social application usage, call and messaging logs, mobility radius, and self-reported mood and stress ratings. A Random Forest Regression model was employed to estimate PHQ-9 follow-up scores, while Random Forest Classification was used to categorize students into Mild, Moderate, and Severe depression groups. Additional classification models were developed to predict stress level (1–5), mood score (0–10), and overall risk grouping (Low/High). Experimental results demonstrate strong predictive capability, revealing that features such as sleep duration, screen time, mobility patterns, and call frequency are key indicators of mental health changes. The proposed behavioral-machine-learning framework provides a scalable, non-intrusive tool for early detection of psychological distress among students, offering potential application in continuous wellness monitoring and intervention support.

Keywords: Depression Prediction, PHQ-9, Stress Detection, Behavioral Data Analysis, Machine Learning Models, College Student Mental Health, Random Forest, XGBoost Classifier, Mood Estimation

Paper ID: 243, TITLE: Quantum Emotion Fields as a Comprehensive Framework for Modelling Complex Human Affective States

Authors: Joshika S, Sourav Acharjee, Ishant Kumar Bajpai and Sanjeev Kumar Jha

Abstract: Quantum Emotion Fields (QEFs) constitute a rapidly emerging domain in affective computing that leverages core principles of quantum theory which includes superposition, entanglement, interference, and contextual probability to model the complexity, ambiguity, and dynamism of human affective states. While quantum-theoretic formulations allow emotional states to exist in partially activated, uncertain, or context-dependent forms within a single mathematical structure, traditional emotion frameworks often fail at properly representing mixed or rapidly changing emotions. The underlying ideas, representational models, affective process frameworks, and computational implementations are synthesized for the QEF research that has been carried out thus far. It further examines how emerging applications in robotics, virtual environments, decision modeling, and quantum-enhanced machine learning are enabled by emotional qubits, quantum state evolution, measurement-induced emotional collapse, and multi-agent emotional entanglement. This work summarizes recent development and points out important challenges for a conceptual basis and future directions in deriving adaptive, context-aware, emotionally intelligent systems based on quantum principles.

Keywords: Quantum emotion fields, Affective computing, Quantum cognition, Emotional qubits, Superposition, Entanglement, Quantum affective decision-making, Quantum machine learning

Paper ID: 245, TITLE: Multivariate Time-Series Forecasting of Educational System Indicators: A VAR-ML Approach with Faculty Projections

Authors: Chawngthu Zoremsanga and Vanlal Ruata

Abstract: Institutional planning and analytic studies require system studying of primary education indicators. This indicator includes Gross Enrolment Ratio (GER), Faculty Strength, Pupil-Teacher Ratio (PTR) and Student Enrolment. This study is based on the All India Survey of Higher Education (AISHE) data publication. Historical data from 2010-

2021 is used as a training datasets to perform prediction on the trend for the year up to 2030. In this study we employed two menthods: Statici- cal methods (VAR) and three Machine Learning Model such as Random Forest (RF), Gradient Boosting (GB) and Support Vector Regression (SVR). The models were tested using an expanding-window backtest on data from 2019 to 2021. The results shows that VAR model did better than the ML models, giving the lowest Aggregated Root Mean Squared Error (RMSE) around 1512. So, VAR model was chosen for the final forecast. The forecast for 2030 shows a strong growth path, with En- rollment reaching about 107,448 and GER expected at 66.24. Also, a extra scenario analysis shows, to reach a policy target of 50% GER by 2030, total faculty needed around 3,746, which means net recruitment of about 1,423 from 2022. These findings give important hints for allocating resources and infrastructure planning.

Keywords: Educational Forecasting, Vector AutoRegression (VAR), Machine Learning, Scenario Analysis, Institutional Planning, Data analysing, Data forecasting

Paper ID: 248, TITLE: Bluetooth-Driven Robotic Arm Gripper Implementation with ARM Cortex Platform

Authors: Prasanth B R, Shoukath Cherukat and Rajesh M

Abstract: Society is increasingly embracing secure automation as technology continues to evolve. This trend is particularly relevant in industrial and defence sectors. Robotic arms are revolutionizing the way objects are handled, performing tasks like picking and placing with remarkable speed and precision. This paper explores the growing role of secure automation in modern society. Specifically, we examine the potential of Bluetooth-controlled robotic arm gripper to enhance safety and efficiency in handling hazardous materials. Its capable of precise and rapid movements, offer a solution for tasks such as bomb disposal. Controlled remotely via Android devices, they can carefully pick and place dangerous objects, minimizing risk to human life. The Bluetooth communication system enables seamless control of the robotic arm gripper movements through a dedicated android application, transmitting commands to the ARM Cortex M4 based STM32 microcontroller that governs the arm's motor functions. This innovative approach showcases the transformative potential of secure automation in high-risk

Keywords: Robotic Arm Gripper, M4 based STM32 ARM Cortex microcontroller, Bluetooth HC-05 module

Paper ID: 250, TITLE: When Emotion Collapses Choice: A Quantum-Inspired AI Framework for Predicting Consumer Impulse Decisions

Authors: Deepanshi Singh and Vidya Arnav

Abstract: Impulse decisions and the quick, unplanned moments where emotion takes the lead are some of the hardest human behaviors to understand or predict. Classical AI approaches tend to rely on linear logic and stable probabilities, which often flatten the depth and fluidity of human feeling. This paper explores a different path. By using ideas from quantum cognition, it treats emotion not as noise or distraction but as a meaningful structure that shapes how people make choices. The proposed quantum-inspired model views emotional states as overlapping and interacting until a final moment of choice “collapses” them into action. Through simulated data, behavioral observations, and model comparison, this study shows that quantum-inspired AI responds more naturally to human hesitation, emotional oscillations, and context shifts. Instead of forcing emotional behavior into rigid patterns, the model lets emotion breathe, offering predictions that feel more aligned with how people truly think and choose. This research aims to open doors toward emotionally intelligent AI systems that support understanding rather than manipulation, and which see human complexity as something to honor instead of simplify.

Keywords: Quantum Cognition, Quantum-Inspired AI, Emotional Superposition, Impulse Buying, Consumer Decision Collapse, Emotional Interference, Affective Computing, Context-Sensitive Modeling, Consumer Behavior Prediction, Ethical AI

Paper ID: 259, TITLE: BREAST CANCER HISTOPATHOLOGY CLASSIFICATION USING ATTENTION-AUGMENTED CNN MODELS

Authors: Amrutha H S and Vimala Mathew

Abstract: Abstract. Breast cancer remains a life-threatening disease affecting women all over the world. Most of the cases are even diagnosed in the advanced stages. Early detection plays an important role in enhancing survival rates. Among conventional methods,

histopathology is often effective in diagnosing and analyzing tumors. The diagnosis using histopathology images is often slower due to the variability of tissues, subtle morphological patterns, and imbalances in class distributions. This is a time-consuming process and it is fully dependent on expert pathologists. In this era of technological advancements, deep learning has emerged as a powerful tool to improve the reliability of diagnostic systems. In this study we are introducing attention-augmented deep learning architectures which integrate the Convolutional Block Attention Module (CBAM) for enhanced feature extraction. Three deep learning models- EfficientNetB0, InceptionResNetV2, and DenseNet-201 were integrated with CBAM and are trained on the BreakHis dataset, which contains 7,909 images across eight tissue categories and multiple magnification levels. By applying contrast enhancement, extensive data augmentation, and transfer learning, our proposed framework achieved strong classification performance. Among the three models EfficientNetB0-CBAM model outperformed others with an accuracy of 97.71%, precision of 97.82% and a recall of 97.71%. The results highlight the capability of the network with attention mechanisms to focus towards diagnostically relevant regions, improving the robustness of the model. These findings show that attention-enhanced CNN architectures, particularly based on EfficientNetB0, are highly suitable for developing accurate and computationally efficient breast cancer diagnosis systems.

Keywords: Breast Cancer, Deep learning, Convolutional block attention module, EfficientNetB0, DenseNet-201, InceptionResNetV2, Histopathological, classification

Paper ID: 263, TITLE: A Study on Steganography using DNA

Authors: Fred Ropekkima Darlong, Poulomi Deb, Kumar Amitabh and Indrajit Tripura

Abstract: Steganography is the practice of hiding data in plain text or other types of media. It is crucial to protect sensitive information from unauthorized access or tampering. Traditional digital storage methods have issues with capacity, security, and traceability. In contrast, DNA-based steganography uses the large storage capacity and complexity of nucleotide sequences. This paper examines the encoding and decoding schemes, security models, synthesis processes, and storage methods of DNA steganography. It also explores trends in encryption patterns, data hiding techniques, and system weaknesses. Conquering the issues of scalability, cost, and standardization remains in spite of tremendous progress in areas such as error correction, biochemical stability, and data security. This review

emphasizes the need for multidisciplinary research integrating information theory, cryptography, and biotechnology in order to overcome the existing limitations. This paper presents future research directions to achieve secure and optimal data hiding using biological sequences by analyzing the benefit and limitation of DNA-based steganography.

Keywords: DNA Steganography, Data hiding, Cryptography, DNA Encoding, Data Encryption, Data Decryption

Paper ID: 264, TITLE: Investigating Nasalized Consonants in low-resource Language Nyishi: From Acoustic Analysis to word-based Speech Recognition model Using Voicegram-based CNN MLP

Authors: Likha Ganu, R.K Bigensana Singh, Vivek Kumar, Dimpi Roy and Madhujya T.Phukan

Abstract: This study presents a detailed acoustic analysis of nasalized consonants in Nyishi, a Sino-Tibetan language spoken in northeast India. This research identifies and analyzes three previously unstudied nasalized consonants in Nyishi, contributing to our understanding of the language's phonetic inventory. Through spectrographic analysis and comparative studies with Malayalam, French, and Tuyuca, the research demonstrates unique spectral patterns in Nyishi's nasal consonants, mainly focusing on the velar nasal [ŋ] and palatal nasal [ɲ]. The study also proposes a novel Voicegram-based CNN MLP Model for Nyishi speech word recognition, achieving 94.21% accuracy using the Swish activation function, significantly outperforming traditional indexing methods. The research utilizes a comprehensive speech corpus comprising 3,000 training files and 400 test files from 34 native speakers across various districts in Arunachal Pradesh. The findings reveal distinctive acoustic features of Nyishi nasalized consonants, including formant transitions, duration patterns, and coarticulation effects. These findings contribute valuable insights to developing theoretical linguistics and speech technology for low-resource languages.

Keywords: NLP Speech Recognition Nasalized Consonants, Voicegram-based CNN Low resource Nyishi Languages, Acoustic Analysis

Paper ID: 269, TITLE: Phishing URL and Email Detection Using Supervised Machine Learning and Explainable Feature Importance

Authors: Sameeksha Singh, Anurag Singh and Ajay Verma

Abstract: Phishing is a leading cyber trick in which crooks use false URLs and emails to steal private data. Researchers are well-known that the traditional systems of detection through blacklist-based and heuristic methods cannot identify new evolving techniques of phishing. Moreover, most of the models based on machine learning are not interpretable, which lowers trust and implementation of such models. The purpose of this research is to develop an accurate and explainable phishing detection model using supervised machine learning and feature importance techniques. First, a large email and URL dataset was pre-processed. SMOTE was used to balance the dataset. Then, it was evaluated using four ML classifiers. These classifiers were Random Forest, XGBoost, LightGBM, and CatBoost. They further combine using a stacking ensemble. LIME and SHAP explainable AI methods were used to interpret the decisions of the models. The ensemble model was found to have the maximum accuracy of 94% and URL length, suspicious words, presence of HTTPS, and special character patterns were found to be the key predictors. Combining supervised machine learning with explainable feature analysis enhances phishing detection effectiveness and clarity. Future work will instantly integrate deep learning and adaptive feature selection in email as well as browser security systems.

Keywords: CatBoost, Email Detection, Explainable AI, Machine Learning, Stacking Ensemble

Paper ID: 273, TITLE: MRI-Based Multi-Class Alzheimer's Disease Classification Using a Hybrid EfficientNet and Vision Transformer Model

Authors: Abhishek Bajpai, Naveen Tiwari, Ayush Kumar, Sowmya Gali, Dziri Jalel and Vivek Srivastava

Abstract: Alzheimer's disease identification that is both early and reliable is still one of the main goals in clinical neuroscience. In such a scenario, a timely diagnosis is able to drastically change the way a patient is managed and the therapeutic results that follow. A hybrid EfficientNet–Vision Transformer model is presented in this research for the multi-class Alzheimer disease classification from structural MRI data. The system merges the

feature-extraction power of EfficientNet for the convolutional features with the ViT component's self-attention-guided ability to locate the distant spatial relationships, thus, enabling a more comprehensive characterization of neuro degenerative patterns. Methodological rigor is assured through the use of a 3-fold cross-validation protocol, and the final model that has been trained achieves an accuracy of 99.35% on the test set. To make the model more understandable, Gradient-weighted Class Activation Mapping Grad-CAM is employed to create the class-discriminative heatmaps that, in fact, reflect the brain regions that are anatomically meaningful and are related to AD progression. Such visual explanations are one of the ways by which the clinical plausibility of the learned representations is reinforced and they also lead to increased transparency of the model decision-making process. Summing up the results, the EfficientNet-ViT proposal is a powerful, interpretable, and clinically relevant method for the automatic multi-stage Alzheimer's disease detection from MRI scans.

Keywords: Vision Transformer, Deep Learning, Machine Learning

Paper ID: 275, TITLE: AI-Powered DNS Traffic Characterization Framework for Identifying Abuse and Tunneling Behaviors

Authors: Sameeksha Singh, Anurag Singh and Ajay Verma

Abstract: Domain Name System (DNS) is a fundamental service of the Internet and has been the target of a range of cyber-attacks, including DNS abuse, covert tunnelling, encrypted exfiltration, and more. As these attacks change quickly, traditional signature-based detection systems can no longer detect them, causing a security gap. This study aims to develop an AI-based framework for DNS traffic characterization that is capable of identifying Normal, DNS Abuse, and DNS Tunneling samples with high accuracy and interpretability. The proposed method consists of exploratory data analysis, statistical behaviour modelling, SMOTE-based balancing, and a range of deep learning models, which include ANN, FNN, DNN, and Soft Voting Ensemble. It extracted some key features like frame length, TTL, UDP source ports, and query types, which were evaluated and used LIME for interpretable model reasoning. According to the experimental results, the performance of the models is exceptional, where FNN gives the highest accuracy of 99.53% and closely following them are DNN and the ensemble models. The conclusion is that using behavioral characteristics with deep learning is a robust, generalizable, and

transparent solution to the detection of abuse and tunneling of DNS traffic that can form a solid basis for real-time network defense.

Keywords: AI-Powered Detection, Deep Learning, DNS Abuse, DNS Tunneling, Machine Learning, SMOTE

Paper ID: 280, TITLE: Enhancing Ternary Content Addressable Memory Reliability With Error-Tolerant Convolutional Logic Code Synthesis

Authors: Suresh Kumar B and Sowmya Injeti

Abstract: In modern computing systems, memory reliability is crucial, as errors in storage and retrieval can lead to data corruption, system crashes, or performance degradation. Traditional RAMs employ error correction techniques such as Error-Correcting Code (ECC) memory and parity bits to detect and rectify bit flips. However, these methods suffer from limitations like increased latency, higher power consumption, and limited error correction capability, making them inadequate for high-speed, high-density memory applications. To overcome these drawbacks, this work proposes a TCAM Error Correction (TCAM-EC) approach, where data is stored within Ternary Content Addressable Memory (TCAM), which is susceptible to errors during read and write operations due to process variations, aging effects, and external disturbances. To ensure robust error detection and correction, the Error-Tolerant Convolutional Logic Code Synthesis (ET-CLCS) technique is introduced, leveraging convolutional encoding principles to efficiently identify and correct errors without significantly impacting performance or power efficiency. This method enhances memory reliability while maintaining the high-speed search and retrieval capabilities of TCAM, making it suitable for applications requiring fault-tolerant memory operations in data-intensive environments.

Keywords: Memory error correction, fault-tolerant memory, read-write errors

Paper ID: 285, TITLE: Automated Bloom's Taxonomy Classifier for Computer Science Domain Questions Using an Advanced Deep Learning Model - DeBERTa-V3 and GRU

Authors: Rajesh Lohani

Abstract: Assessment in education has undergone considerable changes with the introduction of new artificial intelligence (AI) and natural language processing (NLP) technologies. However, classifying examination questions according to Bloom's cognitive taxonomy is still a laborious, subjective task. This paper presents a fully automated system to classify computer science domain-specific questions based on their cognitive level using a combination of deep transformer networks with a recurrent neural network (RNN) and a Bidirectional gated recurrent unit (Bi-GRU). Previous research attempted to automate classification, but very few were domain-specific and belongs to other domains. The proposed system will be trained on a dataset consisting of around 4000 computer science and information technology examination questions with each question annotated at one of six Bloom's cognitive levels: Remember, Understand, Apply, Analyse, Evaluate, Create. Our approach uses DeBERTa-V3 as the embedding layer and Bi-GRU as the recurrent component with both attention layers added for increased performance. We also added SHAP values to provide explainability to our model's output. The experimental results show that our approach outperforms traditional transformer-based models. Specifically, this paper has achieved 92% accuracy. Our model can visually represent the attention weights of each token, allowing teachers to assess why certain tokens were used when making a decision about the cognitive level of a question. This research provides an advancement to the field of educational AI, particularly in terms of domain-specific dataset, output accuracy explainability, and provides the foundational knowledge needed to integrate automated Bloom-level classification into intelligent learning management systems.

Keywords: Blooms Taxonomy, NLP, Transformer, Question Classification, Deep Learning, DeBERTa, GRU

Paper ID: 287, TITLE: A Deep Learning-Based Real-Time Indian Sign Language to Text Translation System Using Mediapipe and MobileNetV2

Authors: Sumedha Verma and Neeraj Kumar

Abstract: Automatic Indian Sign Language recognition remains constrained by the lack of dense, publicly available static-frame datasets and scalable inference for real-world sentence transcription. This work proposes a real-time CNN-based ISL alphabet and control-gesture recognition pipeline that enables continuous sentence formation through landmark-driven ROI extraction and temporal stability gating. A 49-class dataset was

manually collected via a 720p mirrored webcam feed, covering 26 alphabets (A–Z), 10 digits (0–9), and 13 additional conversational or control gestures including SPACE, DONE, CLEAR, DELETE, and NEXT. Hand regions are dynamically cropped using normalized bounding-box extrema derived from multi-hand landmark aggregation in MediaPipe Hands, padded by 40 pixels for full hand context, resized to 128×128, normalized, and fed into a transfer-learned classifier. Spatial feature learning is built on the lightweight depthwise CNN backbone of MobileNetV2, initially frozen for representation retention and progressively fine-tuned in staged unfreeze blocks. The Keras head stacks dense 512 and 256 ReLU units with BatchNorm and dropout for overfitting mitigation, culminating in a 49-way softmax. Under an 80/20 train/validation split, the model achieves 95.6% training accuracy and 99.6% validation accuracy, consistent with low-resource transfer-learning baselines. End-to-end inference reaches approximately 18–25 frames per second on CPU-only execution. The key contribution is a scalable, static-frame, command-aware ISL vision corpus and a stability-gated transcription pipeline supporting continuous sentence formation with CPU-feasible reproducibility.

Keywords: Indian Sign Language, Gesture recognition, Deep learning, MediaPipe, MobileNetV2, computer vision, Transfer learning, Image classification

Paper ID: 288, TITLE: ArticulateAI: Unlocking Communication via Lipreading Technology

Authors: Ragita Kumari and Neeraj Kumar

Abstract: Lip reading plays a critical role in communication when audio signals are unavailable, distorted, or intentionally muted. This research presents ArticulateAI, a deep learning based visual speech recognition system that interprets spoken words solely from movements. The proposed model employs a hybrid CNN–BiLSTM architecture with an attention mechanism to capture both spatial lip features and temporal motion patterns across video frames. A custom mouth-cropped dataset was recorded and preprocessed to train the model, ensuring consistency in visual input and enhancing recognition accuracy. The system was deployed through a Streamlit interface, enabling real-time prediction from user-recorded silent video clips. Experimental results demonstrate that the model can reliably classify multiple spoken words with promising accuracy, validating its potential for assistive communication, silent speech interfaces, and low audio or surveillance

environments. This work highlights the effectiveness of deep learning techniques in visual speech decoding and paves the way for more robust sentence-level lip reading systems.

Keywords: Lip Reading, Visual Speech Recognition, Deep Learning, CNN–BiLSTM Architecture, Attention Mechanism

Paper ID: 289, TITLE: DistilBERT-Based Bail Analytics with SHAP and LIME: A Responsible AI Approach to Criminal Case Evaluation

Authors: Nikshep Paliwal, Dr. Sarwan Singh and Anita Budhiraja

Abstract: Abstract. Today, we all know that the Indian judiciary is facing a huge backlog of cases, and deciding bail applications is one of the most sensitive and important responsibilities of the courts. It's important to protect a person's basic right to freedom, but at the same time, the investigation and trial must stay safe and fair. In real court situations, bail decisions often change from one judge to another. Judges also have to handle many cases with complicated details and very little time. Because there is no single, scientific method to check the risk of giving someone bail, decisions can become inconsistent. To address this gap, our study proposes a system powered by Explainable AI (XAI). We utilized the 'In-dian Bail Judgments 1200 Dataset' a collection of real-world case records including factual summaries, specific legal arguments, and the final verdicts to build a tool that assists in evaluating bail pleas with greater consistency and transparency. Our method uses DistilBERT, a smaller and faster Transformer model, and trains it to predict whether a person is likely to get bail or not based on the case details written in text. To make the model's decisions easy to understand, we also use SHAP and LIME. These tools show which specific words, sentences, or legal points influenced the prediction. The model provides an accuracy approximately between 80-84%. The explanations distinctly highlight the legal elements, including the severity of the charges the accused prior criminal record any threats to witnesses the existence of a conspiracy or the discovery of any incriminating evidence. This research is among the efforts, in India to apply explainable machine learning for decisions regarding bail. It aims to support the justice system by creating AI tools that are responsible, transparent, and trustworthy.

Keywords: XAI, Bail Prediction, NLP, DistilBERT, SHAP, LIME, Judicial Decision Support, Transformer, Models

Paper ID: 290, TITLE: A Multi-LSTM Ensemble and PPO-Driven Trading Agent with Integrated FinBERT Sentiment Intelligence

Authors: Moodu Venkatesh and Prasoon Kumar K G

Abstract: Automated trading of stocks has attracted much attention because of their ability to process complex financial data and make decisions based on such processing. Traditional bots based on RL and DRL perform very well in the gaming environment but are not feasible to be directly applied to the financial markets because of their high noise levels, dynamic nature, and complexity. The project proposes an enhanced version of a stock trading bot using a hybrid model that combines PPO and LSTM networks. Unlike other DRL-based models, this uses an ensemble technique through multiple parallel LSTM layers. In this paper, each LSTM layer specializes in extracting different types of temporal patterns from key variables for the stock market, namely opening price, closing price, trading volume, etc. The features that are aggregated will then be used by the PPO model for optimal trading action, either to buy, sell, or hold. The model uses FinBERT for the sentiment analysis of news data. This allows the bot to further refine its predictions by classifying the emotions of news as positive, negative, or neutral. This improvement corrects some of the deficiencies of the existing approaches, such as low adaptability to complex market patterns and dependence on limited feature extraction. The ensemble technique, i.e., hybrid integration of LSTMs and PPO, improves the performance of the bot in decision-making, generalization, and robustness in dynamic financial environments.

Keywords: Reinforcement Learning (RL), Proximal Policy Optimization (PPO), Long Short-Term Memory (LSTM), FinBERT (Sentiment Analysis)

Paper ID: 291, TITLE: Performance Enhancement of Optimized Dynamic Circuit for Low-Power and High-Speed Applications

Authors: Km Ankita Tripathi, Jaanhvi Srivastava, Abhay Pratap Singh and Arjesh Jha

Abstract: In this work the design of a high-speed, low-power dynamic comparator for analog-to-digital converter (ADC) applications is proposed and analyzed. The design incorporates a differential amplifier-based pre-amplifier and a regenerative latch made up

the two-stage design of the proposed circuit. In order to improve performance, more transistors are added to act as control switches, isolating the pre-amplifier stage once the latch is engaged. Without compromising comparison accuracy, this method significantly lowers kickback noise and dynamic power dissipation. To achieve a power-delay trade-off, an improved version of the proposed design is also developed, offering flexibility for various design objectives. The Cadence Virtuoso tool is used to construct and simulate the comparator in 45nm CMOS technology. The proposed circuits key parameters such as the power consumption, offset voltage, propagation delay, and power-delay product and offset voltage for which the simulation results are significantly superior to those of conventional dynamic comparators. Because of its enhanced speed and energy efficiency, the recommended comparator is perfect for high-performance, battery-operated, low-voltage ADC systems.

Keywords: Dynamic Comparator, Preamplifier, Latch, Analog-to-Digital Converter, Power-delay Product, Kickback Noise, CMOS Technology

Paper ID: 301, TITLE: Uncertainty-Aware Probabilistic Deep Learning Frame-work for Medical Diagnosis and Risk Prediction

Authors: Rocky Kumar, Jeetendra Kumar Singh and Sudhir Kumar

Abstract: Deep learning has shown spectacular results in the automatic medical diagnosis; however, the traditional neural networks give deterministic out puts without the vocabulary of confidence levels which reduces their clinical trustworthiness. In high-risk medical environments, the estimation of uncertainty is essential in support of safe and accountable decision-making. This paper introduces an Uncertainty-Aware Probabilistic Deep Learning Framework, designed to quantify and interpret the predictive uncertainty in disease diagnosis and clinical risk prediction. The framework combines Bayesian Convolutional Neural Networks, Monte Carlo Dropout and Depe-Ensemble modelling to model both epistemic and aleatoric uncertainties. Additionally, multimodal feature fusion involves fusing imaging features with patient clinical information which improves the diagnostic reliability of a wide variety of input sources. Experimental evaluations were performed in publicly avail-able clinical data sets, such as ChestX-ray14, for classification of diseases of the thorax, and MIMIC-III for ICU mortality and sepsis risk prediction. Results show that our model results in improved diagnostic accuracy and substantially

improves probability calibration and leads to less misclassification under ambiguous or noisy conditions. Furthermore, uncertainty heatmaps and confidence-score visualizations give a way to get interpretable insights that can help clinicians to detect high-risk or diagnostically uncertain cases. Our results emphasize the need for probabilistic modelling to ensure robust medical AI and the potential for uncertainty-aware models in real-world healthcare deployment, early warning systems, and clinical decision support.

Keywords: Probabilistic Deep Learning, Bayesian Neural Networks, Uncertainty Estimation, Clinical Risk Prediction, Medical Imaging, Trustworthy AI, Healthcare Analytics

Paper ID: 305, TITLE: Federated Deep Learning with Graph-Based Defense for Privacy-Preserving Big Data Analytics in Distributed Systems

Authors: Sudhir Kumar, Jeetendra Kumar Singh and Rocky Kumar

Abstract: The growth of big data in decentralized networks, such as the Internet of Things and healthcare, introduces major challenges for centralized deep learning approaches that stem mostly from data privacy regulations and cost of communication. Federated Learning (FL) provides an alternative solution that is decentralized as models are trained locally. However, standard FL is however still prone to privacy inference attacks, data poisoning and performance degradation on non-IID data. This paper presents a strong Federated Learning framework combining the two techniques of Differential Privacy (DP) and Graph Based Anomaly Detection. Our approach ensures good privacy guarantees by the use of calibrated noise in client updates and uses the structure provided by a graph to filter malicious updates based on the geo-metric relationships between the client contributions. Evaluated on a multi-modal medical dataset (CheXpert), our model gets 94.5% accuracy, as high as centralized learning, and ensuring a high level of privacy ($\epsilon < 2.0$). It outperforms the model (FedAvg) used as a baseline quite a lot, as FedAvg achieved 89% accuracy with a low privacy level, and shows strong resistance to model poisoning attacks. This framework offers a scalable and secure solution to big data privacy-sensitive applications.

Keywords: Federated Learning, Differential Privacy, Privacy-Preserving Machine Learning, Big Data Analytics, Graph Neural Networks, Cyber-Security

Paper ID: 306, TITLE: A Comparative Analysis of Contemporary Multilingual and Indian Centric Language Models with a Hybrid LLM–Rule-Based Framework for English–Sanskrit Translation

Authors: Mohammad Monis Khan, Aayush Kemni, Archana Sachindeo Maurya, Aditi Sharma, Promila Bahadur, Girish Chandra and Divakar Yadav

Abstract: Recent advancements in neural machine translation (NMT) and large language models (LLMs) have greatly improved multilingual natural language processing. However, structurally complex and low-resource Indian languages, especially Sanskrit, still present challenges due to their rich morphology, productive sandhi rules, flexible word order, and limited access to high-quality digital corpora. This paper presents a comparative study of leading multilingual translation systems, such as NLLB-200, MADLAD-400, Google USM, ALMA-R, and TOWER, alongside emerging Indian language centric translation models like IndicBART, IndicTrans2, Sarvam-1-1, Airavata, Bhashini, and Krutrim. Different machine learning approaches along with large language models have been trained to achieve accuracy ranging between medium to high. Further, a hybrid translation architecture is recommended that combines LLM-driven model along with deterministic rule-based advances. Sanskrit grammar engine based on Paninian linguistic principles. This hybrid design seeks to ensure both semantic fidelity and grammatical accuracy, providing a foundational approach for developing high-quality English, Sanskrit machine translation system.

Keywords: Machine Translation, LLMs, Indian NL, Indian Languages, Sanskrit, Transformers, Hybrid Systems

Paper ID: 315, TITLE: Fabrication of MoS₂-DNA-ZnO nano-bio composite Flexible Electronic Sensor for ultra-low level of Hg⁺² Detection

Authors: Dr. Milan Sasmal, Rajeev Dhar Divedi, Pramod Kumar and Tapendra Kumar Vaishnav

Abstract: Here, we have synthesized MoS₂ nanosheets from MoS₂ bulk powder using the “liquid phase sonication method”. After that, we conjugated with ZnO nanoparticles and deoxyribonucleic acid (DNA). This conjugate of MDZ (MoS₂-DNA-ZnO) shows excellent

sensing properties for the detection of low level of mercury ion (Hg^{+2}). Also, characterized by field-emission scanning electron microscopy (FESEM), ultraviolet-visible spectroscopy (UV-Vis spectroscopy), Fluorescence (FL) spectroscopy, and FTIR (Fourier transform infrared radiation) spectroscopy. In this work, Absorption spectra were observed and determine the bandgap of MoS₂ and ZnO with the help of the Tauc's Plot and also, using the Fluorescence spectrum, we saw the quenching effect on the detection of Hg^{+2} ion. Also, We Fabricate the device on a flexible substrate (PET). For this device fabrication, we prepared a mask using SolidWorks software and printed this mask using a SLA type 3D Printer. Then device was prepared by a vacuum thermal evaporation system. For the detection of Hg^{+2} ion, we used the Drop Casting method on SMU (Source measure unit). Hg^{+2} ion detection by MDZ composite was performed by observing the variance of conductance with the concentration of Hg^{+2} ions.

Keywords: MoS₂ nanosheets, ZnO nano-particles, Deoxyribonucleic acid (DNA), flexible device, and mercury ion.

Paper ID: 317, TITLE: FPGA Implementation and Synthesis of Rate-1/2 Convolutional Encoder and Deterministic Viterbi Decoder on Basys3 (Artix-7)

Authors: Shruti Shakya, Ayushi Ayushi, Sreeja Maddula, Anand N and Dr. Jayaraj U Kidav

Abstract: Robust forward error correction (FEC) techniques are necessary for reliable data transmission in noisy communication channels. Because of its simplicity, deterministic behavior, and suitability for digital circuits, convolutional encoding in conjunction with Viterbi decoding has long been recognized as one of the most effective error-correcting schemes for real-time hardware environments. This study uses Verilog HDL to present the full design, simulation, hardware implementation, and experimental validation of a rate 1/2 convolutional encoder coupled with a deterministic Viterbi decoder. The Basys3 Artix-7 FPGA development board is used to implement both encoder and decoder architectures. The decoder uses state transitions and branch metric comparison to implement the Viterbi algorithm, while the convolutional encoder uses a two-bit shift-register-based state machine that generates two parity bits for each input bit. The accuracy and robustness of the implemented design are confirmed by the entire system, which includes simulation on Vivado, testbench-based random bitstream testing, and real-time FPGA verification.

Because of its resource efficiency, the suggested design can be used for low-power embedded hardware, digital communication system prototypes, and academic learning. Advanced FEC schemes like turbo codes, LDPC codes, soft-decision Viterbi decoders, and SDR-based implementations use the work as an experimental basis.

Keywords: convolutional code, Viterbi decoder, FPGA, Basys3, Verilog, forward error correction

Paper ID: 319, TITLE: Detection of Phishing Domains Using Machine Learning

Authors: Sukanta Das, Riddheswar Banik, Poulomi Deb and Niladri Das

Abstract: Phishing is a type of online fraud in which attackers collect our sensitive information by fooling us. Cyber attackers often create fraud websites to trick users into sharing sensitive information such as passwords, bank details, and personal information. This study introduces a machine learning-based intelligent system that detects phishing domains by analyzing features of URLs. A dataset of 10,000 URLs with 48 primary features has been used. logistic regression, CatBoost, support vector machine, K-Nearest Neighbours, Artificial Neural Network, Decision Tree, Random Forest, XGBoost and LightGBM these are the nine popular machine learning algorithms that have been executed and assessed. By applying systematic feature selection we can enhance the efficiency and also can reduce the number of features to only 9 core features without disturbing the detection performance. XGBoost showed the strongest performance among all models, 98.7% accuracy was attained on full data set and 97.7% accuracy on optimized dataset. The results suggested that by reducing the features computational efficiency increases noticeably, while accuracy remains the same. Due to this accuracy, the model is more for real-time phishing spotting. This research demonstrates that to avoid phishing, cybersecurity is the solution and it should be accurate, fast and efficient.

Keywords: Phishing Detection, Cybersecurity, Machine Learning, Feature Selection, XGBoost Algorithm, URL analysis.

Paper ID: 322, TITLE: Hardware Implementation of CNN Accelerator for Image Processing Applications

Authors: Niveditha George, Anupam Kumari, Roy Paily Palathinkal and Jayaraj U. Kidav

Abstract: The primary basis of modern image processing and deep learning frameworks is the Convolution Operations that are found at the heart of all Convolutional Neural Networks (CNNs). In this paper, we will present a design and an FPGA- based implementation of a high-speed 2-D Convolution Hardware Accelerator called conv2d fast, designed in Verilog for real-time Image Processing and Feature Extraction. The Architecture presented is scalable to support different-sized images and filter (Kernel) sizes through a pipelined State Machine and can be configured to run several types of Spatial Filtering Kernels, including but not limited to Sobel Edge Detection, Gaussian Blur, and Sharpening. Both Vivado Simulator and Synopsys DVE were used to simulate and verify the Design and Performance of the proposed System. In comparison to Software-Based Implementations traditionally employed, the proposed design offers significant increases in computational speed while maintaining flexibility and Accuracy. The Results clearly indicate the appropriateness of conv2d fast for incorporation into Embedded Vision Systems utilizing CNNs and as part of FPGA or ASIC-oriented image Processing Pipelines

Keywords: Image Processing, Convolution Neural Network (CNN), Edge Detection, Image Blurring, Image Sharpening

Paper ID: 325, TITLE: Numerical Modeling of Efficient Lead-Free Inorganic Perovskite Solar Cell Using SCAPS-1D

Authors: Vaibhava Srivastava, Ghanshyam Shivhare, R.K. Chauhan and Sachin Singh

Abstract: Perovskite solar cells (PSCs) have become one of the most promising emerging thin-film photovoltaic technologies. However, traditional lead-based perovskites face major limitations due to their toxicity and limited long-term stability, creating a strong need for environmentally friendly, lead-free alternatives. In this work, SCAPS-1D software is used to simulate a PSC based on a stable and eco-friendly inorganic absorber. To enhance carrier mobility, electron transport layer (ETL) is incorporated, and the commonly used PCBM is replaced with graphene oxide (GO), which also contributes to lowering the device cost. The key design parameters, such as thickness, acceptor concentration and defect

density of absorber layer, metal work function and operating temperature are thoroughly examined. With GO functioning as the ETL, optimized device performance achieved includes a PCE of 25.27%, Voc of 1.12 V, Jsc of 28.51 mA/cm², and an FF of 79.0%. The proposed lead-free PSC structure offers a promising route to addressing stability and toxicity concerns while improving overall device performance.

Keywords: Numerical simulation, SCAPS, ETL, HTL

Paper ID: 329, TITLE: Two-Port Rectangular Quarter Mode Substrate Integrated Waveguide (R-QMSIW) MIMO Antenna for WiMAX, Sub-6 GHz and WLAN Applications

Authors: V Shiva Prasad Nayak

Abstract: This manuscript presents a miniature dual-band Rectangular Quarter-Mode Substrate Integrated Waveguide (R-QMSIW) 2-port MIMO antenna for WLAN, Sub-6 GHz, and WiMAX applications. The antenna is loaded with triangular slots on the top of the patch and a defective rectangular slot on the bottom of the radiating ground plane to achieve dual-band performance. The antenna is implemented, simulated, and enhanced using the CST Studio Suite software tool. The results demonstrate successful dual-band operation, covering the frequency bands of 3.55 GHz to 3.64 GHz and 4.79 GHz to 4.90 GHz. The antenna exhibits good impedance matching within these bands. Proposed with reflection coefficients of -34dB and -31dB at 3.59GHz and 4.85GHz, the antenna also achieves peak gains of 3.9dBi and 3.35dBi and also observes an Envelope Correlation Coefficient (ECC) < 0.077 and Diversity Gain (DG) > 9.970dB. The suggested antenna is an appropriate choice for deployment in modern 5G communication systems, based on simulation findings that display an attractive radiation pattern and gain.

Keywords: Slot, Rectangular-Shaped Quarter Mode Substrate Integrated, Waveguide, Bandwidth, Gain, Isolation, Sub 6-GHz

Paper ID: 331, TITLE: IMPROVING TEXT CLASSIFICATION ACCURACY USING HYBRID NLP AND DEEP LEARNING TECHNIQUES

Authors: Sandip Singh and Ram Kumar

Abstract: One of the main problems of natural language processing (NLP) is text classification, especially since it is nearly impossible to possess in-depth semantic interpretation and context-sequential organization. The suggested work is a hybrid text classification, comprising of embedding contexts through the use of Bidirectional Encoder Representations of Transformers (BERT) and sequential feature encoding through the use of Bidirectional Long Short-Term Memory (BiLSTM). The weighted feature fusion mechanism is employed to combine the two representations to form a hybrid one, which is more discriminative. The proposed model is tested within the frames of an experimental approach which presupposes the pre-processing of the dataset, hybrid feature engineering, model training, and benchmarking of its performance on three popular datasets: IMDB, AG News, and Amazon Reviews. The comparative analysis with CNN, LSTM, BiLSTM, and BERT-only baselines shows that the hybrid model is always more accurate, precise, recall, and F1-scores, and the error rates in it are also lower. These improvements are statistically validated with the help of the McNemar test. The findings demonstrate the strengths and efficiency of the hybrid BERTBiLSTM architecture and make it a viable and trustworthy tool in high-level text classification.

Keywords: BERT, BiLSTM, Hybrid Deep Learning Text Classification, Natural Language Processing

Paper ID: 341, TITLE: DIGITAL TECHNOLOGY AS A CATALYST FOR ENTREPRENEURSHIP, ARTISANAL INNOVATION AND LIVELIHOOD ENHANCEMENT: EVIDENCE FROM TERRACOTTA AND DECORATIVE CRAFT CLUSTERS OF GORAKHPUR, DEORIA AND KUSHINAGAR

Authors: Mukul Vedi and Vaishali Sharma

Abstract: The digital technology has become a main driver of change that impacts developing economies through different ways such as, for instance, modern and even traditional entrepreneurs, new and better developed products, and increased living standards. In India, among the possible impacts of the digital infrastructure development (which was very rapid and comprehensive—smartphones, UPI payments, e-commerce, online learning, and so on) the socio-economic transformation of rural and artisan communities has been very noticeable. The main focus of the paper is to investigate how digital technologies have been able to positively influence not only the entrepreneurial

intentions but also the livelihood outcomes of the artisans, especially the terracotta artisans of Gorakhpur and the artisans producing handmade decorative items in the Deoria and Kushinagar districts of Uttar Pradesh. The study consists of a mixed-method approach that incorporates not only primary data gathered from the field but also a thorough review of secondary literature, analysis of government reports, and case studies. It emphasizes the role played by digital tools like ONDC, WhatsApp Business, Instagram, and YouTube in areas such as product diversification, improved market access, and increased incomes for artisans. The case of the Gorakhpur cluster shows that the combination of digital skills and design innovation in terracotta artificial jewelry has raised the average monthly income of artisans significantly. Additionally, the SHG women artisans of Deoria and Kushinagar are also demonstrating raising interest in digital marketing and e-commerce participation. However, along with these positive aspects, issues like low digital literacy, inadequate infrastructure, and limited awareness of online marketplace logistics are still there to contend with. The research results indicate that the empowerment of artisans at the grassroots level through the adoption of digital technology leads to their economic upliftment, change of their entrepreneurial attitude, and increased social mobility. The paper concludes by recommending targeted digital literacy programs, tech-enabled incubation support, and strong market integration to ensure inclusive growth aligned with the national vision of Viksit Bharat @2047.

Keywords: Digital Entrepreneurship, Innovation, Livelihood

Paper ID: 343, TITLE: Bridging the Linguistic Divide: A Comprehensive Review of Methods and Challenges in Low-Resource Machine Translation

Authors: Sunil Angom, Pougailung Gangmei and Moirangthem Daniel Singh

Abstract: Large Language Models (LLMs) have become useful in high resource languages due to the rapid advancement of Natural Language Processing (NLP), yet the vast majority of languages in the world remain underserved due to a drastic lack of data. To develop a complete taxonomy of Machine Translation (MT) methods on Low-Resource Languages (LRLs). We explore the construction of translation technologies critically and identify a non-linear hierarchy of appropriateness: Rule-Based (RBMT), and Statistical Machine Translation (SMT) remain essential in terms of "digitally dark" languages such as Tulu and Kangri, and Transformer-based frameworks and Parameter-Efficient Fine-Tuning (PEFT)

demonstrate fluency in situations with mid-resource scenarios. As well, we evaluate information-based interventions by balancing the advantages of parallel corpus mining with the harm of synthesizing artificial data that could lead to semantic polarity change in sensitive domains. This paper discovers the crossover points when statistical rigor should be replaced by the brain plasticity through integrating research on dynamic language recognition, hybrid transfer learning, and retrieval-augmented generation (RAG). The conclusion of the review provides a strategic direction in future research that will require neuro-symbolic hybrid architectures and culturally based evaluation criteria to attain genuinely inclusive global communication.

Keywords: Low-Resource Language, Neural Machine Translation, Large Language Models, Parameter-Efficient Fine-Tuning

Paper ID: 346, TITLE: Evaluating AI Models for Mental Health Monitoring and Diagnosis: A Comprehensive Systematic Review across Text, Speech and Physiological Signals

Authors: Gaurav Sharma and Gaurav Gupta

Abstract: In this review findings from 63 studies examining the use of artificial intelligence for mental health assessment across physiological, linguistic, acoustic, and multimodal data sources were compared. The most frequently investigated conditions were depression and stress, they are supported by the availability of structured datasets and their high global burden. The research on physiological signals, especially EEG, HRV, ECG, and electrodermal activity, showed great results, with many hybrid deep-learning models that reported accuracies over 97%. Text-based methods with transformer architectures like BERT and RoBERTa were very good at finding depression, anxiety, and suicidal thoughts in clinical records and social media. In the models where speech is used to look at prosodic and acoustic features also showed good prospects for diagnosis. The multimodal systems that combined physiological and behavioural indicators always worked better than the single-modality systems, which shows that combining signals that work well together is useful. Despite these improvements, there were still big problems with the methods used. Numerous studies depended on limited or demographically restricted samples, they lacked external validation, or failed to include calibration metrics and interpretability analyses in the study. The absence of fairness assessments and bias

evaluation raised concerns about equitable deployment in diverse populations. Overall, improved dataset diversity, methodological transparency, and rigorous validation are essential before clinical integration can be achieved safely and responsibly in practice.

Keywords: Anxiety, Depression, Mental health, Machine learning, Deep Learning, Artificial Intelligence

Paper ID: 347, TITLE: Non-Western Logic Traditions for Explainable AI: A Survey and Research Agenda

Authors: Abhinaba Basu and Vikas Mittal

Abstract: Explainable AI (XAI) research predominantly relies on Western logic traditions-Aristotelian syllogisms, Toulmin's argumentation schemes, and formal symbolic logic. However, non-Western cultures have developed rich epistemological frameworks over millennia that offer complementary perspectives for interpretable AI systems, particularly for modern machine learning models and large language models. We present, to our knowledge, the first dedicated cross-tradition survey of non-Western logic traditions explicitly oriented toward XAI applications, covering traditions from India (Nyaya, Buddhist pramana, Jain logic, Yoga epistemology), East Asia (Neo-Confucian li-qi, Japanese Buddhist inen, Chinese Mohism), Africa (Ubuntu philosophy, Ethiopian rationalism), and Islamic scholarship (Kalam, Falsafa, Sufi epistemology). For each tradition, we identify (1) core epistemological principles, (2) structural reasoning patterns, (3) potential XAI applications, and (4) any existing computational implementations. Key contributions: (i) Concrete illustrative example contrasting Western SHAP explanations with Nyaya-structured, Jain syadvada, and Ubuntu-relational framings for medical diagnosis; (ii) Comprehensive summary table mapping current XAI methods to proposed innovations from twelve traditions, serving as an actionable practitioner reference; (iii) Detailed research agenda with specific tasks, datasets, and success criteria spanning 1-10 year horizons; and (iv) Critical gap analysis showing that most traditions currently lack computational implementations and empirical validation. We review earlier work on Nyaya-inspired systems that reach about 0.91 ERASER sufficiency while still keeping model accuracy high. We also show how ideas from Buddhist apoha, Jain seven-fold predication and Ubuntu-style relational ethics could guide new methods for counterfactual examples, handling uncertainty from several viewpoints, and measuring relational fairness.

Overall, this survey aims to move XAI beyond a purely Western way of thinking and to support cross-cultural discussion on how we design and evaluate AI explanations.

Keywords: Explainable AI, Non-Western Logic, Nyaya, Buddhist Logic, Ubuntu, Decolonial AI, Cultural AI, Interpretability.

Paper ID: 350, TITLE: Operationalizing Machine Morality: A Lifecycle-Based Governance Framework and Risk Quantification Matrix for Artificial Intelligence

Authors: Arshbir Singh and Deepankar Maithani

Abstract: The rapid integration of Artificial Intelligence (AI) into critical socio-technical infrastructure has outpaced the development of governance mechanisms capable of mitigating its risks. While high-level ethical principles such as fairness and transparency are well-established, a significant "translation gap" remains between these abstract norms and executable engineering practices. This paper addresses that gap by analyzing the trajectory of AI from predictive models to autonomous agentic systems, identifying specific failure points such as proxy variable misalignment and representation bias. We propose a comprehensive Ethical Governance Lifecycle (EGL) and introduce a novel Risk Quantification Matrix (RQM). This metric-based approach moves beyond qualitative checklists, enabling organizations to calculate a composite Ethical Risk Score (ERS) based on measurable key performance indicators, including Bias Exposure, Harm Probability, and Explainability Deficits. Furthermore, we operationalize these metrics through an "Ethical Circuit Breaker," an architectural component designed to monitor model outputs in real-time and intervene when statistical safety thresholds are violated. By treating ethical failure modes as engineering bugs rather than philosophical dilemmas, this study provides a blueprint for moving from theoretical compliance to active risk management, while also addressing the necessity of adversarial robustness in future governance standards.

Keywords: Artificial Intelligence, AI Ethics, Ethical Risk Management, Algorithmic Governance, AI Lifecycle Management, Autonomous Systems, Responsible AI.

Paper ID: 353, TITLE: AI-Augmented Stabilization of RO-PUF Responses Using Cross-Attention and Multi-Task Deep Learning

Authors: Lukram Dhanachandra Singh and Preetisudha Meher

Abstract: Physical Unclonable Functions (PUFs) provide silicon-rooted device identity derived from intrinsic manufacturing randomness, but their practical deployment is hindered by instability under environmental and voltage variations. In particular, Ring Oscillator PUFs (RO-PUFs) exhibit temperature- and noise-induced response drift, traditionally mitigated using error-correction codes (ECC), incurring high area, latency, and power overhead. This paper introduces a novel Cross-Attention Multi-Task Deep Learning (CA-MTDL) framework that learns the underlying physical delay behavior of real hardware rather than heuristically correcting bit-flip errors. Our model combines CNN-based delay encoding, transformer-based temporal modeling, cross-attention fusion between noisy delay patterns and challenge context, and a multi-task head jointly optimizing response stabilization and ΔD delay-drift regression. Using large-scale real RO-PUF measurements from Fraunhofer AISEC over 100,000 CRPs per device and $N=64$, 128-bit challenge spaces, the proposed stabilizer reduces raw BER to the intrinsic noise floor (1.7-1.9%) while maintaining adversarial predictability at $\sim 50\%$, demonstrating resistance to ML-based cloning attacks. Crucially, the approach significantly relaxes ECC requirements, enabling lightweight or even ECC-free deployment in resource-constrained IoT hardware. The CA-MTDL framework therefore establishes a principled and physically interpretable method for AI-augmented PUF stabilization, supporting secure authentication and key-derivation in modern embedded systems.

Keywords: Physical Unclonable Function, RO-PUF, AI-Enhanced Stabilization, Cross-Attention, Deep Learning

Paper ID: 359, TITLE: MQTT-based Distributed Nurse Call System

Authors: Simarpreet Kaur, Tanishtha Kapoor, Harsimer Kaur, Aditya Singh, Prakash Pratik and Snehasis Joardar

Abstract: Efficient communication between hospital patients and nurses is a key element of high quality healthcare delivery. Challenges such as delayed poor co-ordination, delayed responses, and patient dissatisfaction are addressed by various communication

modules that are developed and embedded into hospital systems. These modules leverage advanced technologies, including nurse call systems, wearable devices, Mobile apps, artificial intelligence, and the Internet of Things to enable smooth communication between patients and medical professionals. The patient and the nursing staff can communicate with each other through this module. This wireless system transmits data using a MQTT broker.. It is a fast and reliable module that is used to deliver data without delay by ensuring real-time alerts and responses. This device enables patients to request assistance for basic needs such as cleanliness, washroom support, and other necessities. With cloud integration, a centralised database is maintained to monitor all patients and generate combined reports. Healthcare authorities can access this information for clinical research, analysing trends, and identifying frequent occurring or potential widespread diseases. Additionally, a mobile application and a website are developed for nurses allowing them to receive notifications on their handheld devices hence improving accessibility and response efficiency. The system supports message reliability, acknowledgements through MQTT QoS and scalability for multiple rooms. This module provides an efficient, low-cost and easily deployable alternative to traditional wired systems, enhancing responsiveness and patient safety.

Keywords: IoT, MQTT, ESP8266, ESP32, Nurse calling system, Wireless Alert System, Healthcare monitoring, Real-time communication, Microcontroller, Patient Assistance System

Paper ID: 360, TITLE: Movie Recommendation System Based on Random Forest and Support Vector Machine AI models

Authors: Mahendra Ravi, Yawar Ramzan, Muneer Dar, Sakshi Parashar and Sameer Bhat

Abstract: Digital and multimedia technologies developing rapidly pose hindrance to determining user preferences for recommending movies to users is a challenging task. Building movie recommendation systems overcomes this challenge of movie selection by users. This study reviews recommender systems emphasizing movie recommendations based on highly selected user ratings by users on movies. The study develops an artificial intelligence (AI) model recommending users a movie of their choice, while considering the ratings provided by other users. The proposed method adopts a comparative analysis of machine learning models trained on a public movie dataset. Movie data and credits are

combined, and the related features (such as cast, crew, genres, and keywords) are extracted to preprocess the dataset. The random forest model showed higher training (98.95%) and testing (89.29 %) accuracy as compared to the support vector machines model. This study shows that implementing machine learning models can improve audience engagement, increase recommendation accuracy, and confirm movie market trends, providing a scalable method for tailored movie recommendations since the models can generate highly accurate predictions to recommend movies to the users.

Keywords: Movie Recommendations, Random Forest, Rating-Based, Recommendation, Recommendation Systems, Support Vector Machine (SVM)

Paper ID: 361, TITLE: Deep Learning-Driven Histopathological Analysis for Etiological Classification of Ischemic Stroke Clots Using the STRIP AI Dataset

Authors: Anita Budhiraja, Maninder Singh and Sarwan Singh

Abstract: Correctly identifying the source of a thrombus is essential to provide optimal treatment for ischemic strokes. However, many current imaging modalities are often delayed in their ability to provide this information or are not readily available. The purpose of this study is to fill this diagnostic need by developing a hybrid deep learning framework that provides an automated classification of clot aetiology based upon histopathological image analysis of the STRIP AI datasets. Unlike existing single model approaches, our method intentionally uses three separate technologies to address the complex nature of tissue analysis. First, we utilize a Convolutional Neural Network (CNN) to assess the microstructure of the thrombus via extraction of features such as the alignment of fibrin strands and clustering of erythrocytes. Next, a Transformer encoder model is used to interpret the microstructure features in the context of the larger organization of the slide. Finally, an XGBoost classifier is applied to this information to provide a final decision regarding whether the thrombus is derived via cardioembolic or atherosclerotic processes. Qualitative analyses of results demonstrate how this architecture, particularly the integration of local texture recognition with an understanding of global context, achieves excellent performance in the presence of potential staining variability. The ability to automate the analysis of H&E stains will likely improve the ability of clinicians to quickly and accurately make clinical decisions relating to providing treatment for patients who present with an acute ischemic stroke.

Keywords: Ischemic Stroke, Histopathology, Clot Origin Classification, Deep Learning, CNN-Transformer Hybrid, STRIP AI, XGBoost

Paper ID: 365, TITLE: Chaos-driven and Bio-inspired Cascade Encryption Framework with AI-Enhanced Lossless Steganography for Robust DICOM Image Security

Authors: Madhurima Das and Sachin Motwani

Abstract: Secure storage and transmission of medical images remains a critical challenge in e-healthcare, especially when both - the pixel data and associated metadata must be protected without compromising diagnostic quality. This paper presents a successive chaos- and bio-inspired encryption framework integrated with AI-enhanced lossless steganography for robust 12-bit DICOM image security. It subsequently applies three encryption schemes: a Henon chaotic map encryption, an Arnold cat chaotic map encryption, and (RNA-GA) bio-inspired encryption. The three-layer encrypted DICOM image is then decomposed into its 4-MSB and 8-LSB components and embedded, together with DICOM metadata, into a 24-bit RGB cover image. To enhance imperceptibility, we introduce an AI-assisted, content-adaptive embedding strategy: the cover is partitioned into 3×3 blocks, each described by gradient-energy and variance features, and k-means clustering groups blocks into low-, medium-, and high-complexity regions. MSB/LSB payload is preferentially embedded in high-complexity clusters, while smooth regions are used sparingly, preserving visual quality for a given payload. The entire process is key-driven and lossless, enabling perfect recovery of the medical image ($\text{PSNR} \approx \infty$, $\text{SSIM} = 1$) and faithful reconstruction of embedded metadata.

Keywords: DICOM image security, chaos encryption, bio-encryption, Henon chaotic map, Arnold cat map, RNA-GA bio-inspired encryption, AI-enhanced lossless steganography, content-adaptive embedding, medical metadata protection

Paper ID: 366, TITLE: A Neuro-Fuzzy RoBERTa Architecture for Effective Sentiment Analysis

Authors: Om Prakash Singh, Neha Gupta and Prem Shanker Yadav

Abstract: Sentiment analysis has become an exciting yet challenging area of research. Transformer models often struggle with sentences that carry mixed or unclear emotions, but fuzzy systems can handle these in-between or uncertain sentiments more reliably. To address this, we proposed a combined approach that brings together an Adaptive Neuro-Fuzzy Inference System (ANFIS) with a transformer-based model-RoBERTa. By using ANFIS's rule-based reasoning along with the deep contextual understanding of transformers, our method improves both the accuracy and reliability of sentiment classification. On the IMDb dataset, the framework obtained an accuracy of 0.944 and an F1-score of 0.921, whereas on Sentiment140, it obtained an accuracy of 0.899 and an F1-score of 0.906. This clearly mentioned the performance capability of our approach.

Keywords: Sentiment Analysis, RoBERTa, Adaptive Neuro-Fuzzy Inference System, Hybrid Deep Learning Text Classification Natural Language, Processing

Paper ID: 369, TITLE: AgroBot: A Universal AI-Based Agricultural Assistant Integrating CNN Disease Recognition and Multilingual Chatbot Support

Authors: Mohd Iliyas, Sandeep Kumar Mishra and Priyanshu Pathak

Abstract: Plant diseases significantly affect crop productivity, especially in developing regions where timely access to expert agricultural assistance is limited. Recent advancements in deep learning offer promising solutions for automated disease detection using plant leaf images. However, existing systems are generally limited by monolingual interfaces, lack of explainability, absence of administrative control, and poor field applicability. This paper presents AgroBot, a universal AI-based agricultural assistant that integrates a custom convolutional neural network (CNN) for image-based plant disease recognition with a multilingual knowledge-driven agricultural chatbot. The system supports 38 crop-disease classes with a training image resolution of 128×128 pixels and additional text-based symptom-treatment metadata for eight languages. The CNN model achieved a 95.07% validation accuracy with a validation loss of 0.1969, demonstrating strong classification performance with minimal overfitting. A structured JSON knowledge base powers the multilingual chatbot and aligns with CNN predictions, enabling domain-consistent agricultural guidance. AgroBot further includes a role-based authentication system for farmers and administrators, real-time dataset modification, user management, and a Streamlit-driven deployment interface. The results show that AgroBot provides an

efficient, practical, and extensible approach toward AI-driven agri-cultural support, improving both accessibility and reliability for farmers in rural regions. Future directions include transformer-based diagnosis, mobile deployment, speech-based multilingual assistance, and integration with IoT crop monitoring.

Keywords: Artificial Intelligence, Deep Learning, CNN, Agriculture, Plant Disease Detection, Symptom Embedding, Multilingual Chatbot, Precision Farming

Paper ID: 373, TITLE: Hybrid Intelligence for Understanding Depression Risk Trajectories in Mindfulness-Based Interventions

Authors: Siddhant Ujjain, Pooja Singh, Ahmad Siraj Hashmi, Sandeep Kumar and Tapan Kumar Gandhi

Abstract: Reliable prediction of depression trajectories remains a central challenge in digital mental health, particularly for mindfulness-based interventions (MBIs) where behavioral engagement and symptom evolution interact dynamically. We present a hybrid intelligence framework that integrates individualized “Hybrid Specialists,” trained on baseline severity strata, with a population-level LightGBM model, combined through a learned convex blending function. Using longitudinal data from a multi-site MBI cohort, we forecast Beck Depression Inventory–II (BDI–II) scores at 12 weeks (end-of-intervention) and 24 weeks (follow-up). Our approach captures short-term heterogeneity and long-term generalization: at 12 weeks, the specialist ensemble achieves RMSE=5.62 and $R^2=0.40$, while at 24 weeks, the blended model (weight = 0.72 toward specialists) attains RMSE=4.64 and $R^2=0.49$, surpassing all baselines. Calibration remains near ideal, with tight bootstrap confidence intervals under resampling. SHAP-based interpretation reveals baseline severity, early symptom change, and intervention adherence as dominant predictors. The results highlight how hybrid modeling can support stepped-care triage and continuity planning, advancing personalized mental health analytics for low-resource clinical contexts.

Keywords: Depression prediction, Hybrid models, BDI-II, LightGBM, Mental health informatics, Longitudinal forecasting

Paper ID: 375, TITLE: Retinal Disease Detection Using Deep Learning: A Comprehensive Review

Authors: Pooja Pandey, Anchal Yadav, Nandini Pawar, Radhika Mehrotra and Yash Bhushan

Abstract: Diabetic retinopathy, glaucoma, and cataracts continue to be leading causes of impaired vision worldwide. For these conditions, early detection and precise diagnosis are necessary to prevent irreversible loss of vision. The conventional process of manual diagnosis relies on highly qualified ophthalmologists and is time-consuming; hence, large-scale screening, particularly in resource-constrained settings, is not feasible. Recently, artificial intelligence or deep learning models ranging from CNNs to vision transformers have shown great potential in single-disease automatic detection with high accuracy. However, in real-world clinical practice, multiple diseases of the retina may coexist and complicate the diagnosis. This review provides an overall survey of deep learning approaches, both single-disease and multi-disease, to classify retinal images. The discussion focuses on popular datasets and highlights important challenges such as domain shift, dataset heterogeneity, and model explainability. The paper therefore points to future directions, which involve integration of multimodal data, validation across datasets, and enhanced interpretability to facilitate scalability and clinical viability of AI-driven retinal diagnostics.

Keywords: Retinal disease, fundus image, machine learning, deep learning

Paper ID: 383, TITLE: Skin Disease Prediction Using a Hybrid Deep Learning Pipeline with Segmentation, Feature Fusion, Diffusion-Based Augmentation, and Explainable AI

Authors: Sarwan Singh, Gursimar Singh, Parmod Kumar, Akshada Pande and Jashandeep Kaur

Abstract: Skin diseases represent a major global health challenge, especially in regions where dermatologists are scarce. Limited clinical access often leads to delayed or missed diagnoses, increasing the risk of severe complications. While convolutional neural networks (CNNs) have significantly advanced automated skin lesion analysis, most existing systems rely on single-stage models that suffer from background artifacts, lighting

inconsistencies, class imbalance, and poor interpretability. To overcome these limitations, this work introduces a comprehensive hybrid deep learning framework that integrates lesion segmentation, an enhanced MobileNetV2 backbone enriched with Transformer-based attention modules, diffusion-model augmentation, hybrid deep–handcrafted feature fusion, and dual explainability. The pipeline includes: (i) SegFormer-based segmentation, (ii) an upgraded MobileNetV2 network incorporating CBAM, Multi-Head Self-Attention, LayerScale, and self-supervised pretraining, (iii) diffusion-based synthetic image generation, (iv) MixUp and CutMix regularization, (v) fusion of CNN features with handcrafted descriptors, and (vi) interpretability using Grad-CAM and SHAP. Experiments on HAM10000 and DermNet datasets show a simulated accuracy of 96.4%, outperforming EfficientNetB0, MobileNetV3, and Vision Transformers. Significant gains were observed in melanoma detection — a clinically high-risk category. The optimized TensorFlow Lite model is designed for real-time deployment on mobile and edge devices. Overall, the proposed system improves robustness, generalization, and clinical trustworthiness compared to existing dermatology AI pipelines.

Keywords: Skin disease classification, MobileNetV2, Vision Transformers, SegFormer, Diffusion models, MixUp, Explainable AI, Grad-CAM, SHAP, HAM10000, DermNet

Paper ID: 387, TITLE: GOA-CXGBoost: A Goat Optimization Algorithm-based Convolutional Extreme Gradient Boost Model for Multimodal Oral Cancer Detection

Authors: Manmohan Mishra, Prashant Gupta, Shivam Bhardwaj, Indulata Gupta, Akhilesh Giri and Shubham Singh

Abstract: Oral cancer is also an important public health problem worldwide, mainly because of the fact that it often presents it-self at an advanced stage, which has a strong impact on the survivability of the disease by increasing mortality rates. Consequently, early, accurate and reliable detection is needed to improve patient survival and optimise clinical out-comes. Traditional diagnostic methodologies, relying on a great deal of expert pathologists, often experience subject-tivity, inter-observer variability, and long procedures timelines. To overcome these limitations the Google optimization algorithm enhanced Convolutional Extreme Gradient Boosting i.e. GOA_ConvXGB is proposed to address the multimodal oral cancer detection. The multimodal data set includes histopathological images, clinical information and sociodemographic attributes. First, Mean-Shift Filtering

is used to properly denoise the histopathological images. Subsequently, Swin-UNet is used for the task of exact blood cell segmentation. From the segmented images, texture features namely Haralick Features and Pairwise Rotation-Invariant Co-Occurrence Local Binary Pattern (PRiCoLBP) features are carefully extracted. At the same time, clinical and sociodemographic data are subject to systematic preprocessing using Hyperbolic Tangent Function based Normalization to make the data uniform and improve the data's feature representation. The extracted rich features from histopathological images are then amalgamated with normalized clinical and sociodemographic data and aggregated together for final classification using the robust Convolutional extreme Gradient Boosting (ConvXGB) algorithm. Moreover, the ConvXGB model is optimized exactly via the Goat Optimization Algorithm (GOA) in order to boost its predictive performance. The proposed GOA_ConvXGB framework shows an excellent performance with an accuracy of 95.147 percent, True Negative Rate (TNR) of 95.411 percent and True Positive Rate (TPR) of 94.661 percent and thus prove itself as an efficient tool to early and accurately diagnose oral cancer.

Keywords: Oral Cancer, Mean-Shift Filter, Hyperbolic Tangent Function-Based Normalization, Convolutional eXtreme Gradient Boosting (ConvXGB), Goat Optimization Algorithm, Swin-UNet, Haralick Features, PRiCoLBP, Multimodal Diagnosis

Paper ID: 389, TITLE: Design and Integration of a Thin Semi-Flexible High Directivity Microstrip Patch Antenna for X Band Advanced RF Frequency Applications

Authors: Janani P and Koushick Venkatesh

Abstract: A flexible slot-loaded micro-strip patch antenna design tailored for X-band futuristic concern, such as satellite communications, radar systems, and fast telecommunication links. Operating within the 8–12 GHz frequency range, the X-band offers high data rates and compact component dimensions, making it ideal for next-generation communication systems. The slot-loading technique is integrated into the patch structure to enhance bandwidth and improve impedance matching without significantly increasing the antenna's size. Moreover, the low-profile and lightweight characteristics of micro-strip antennas, combined with the mechanical flexibility and reconfiguration of the

proposed design, make it suitable for futuristic, compact, and adaptive systems. Even though FR4 substrate is known for its rigidity and which is said to be non-inherently designed for flexible antenna when compared to flexible polymers or fabrics. Performance metrics such as high gain, wide bandwidth, low return loss, and stable radiation characteristics across the X-band further affirm its potential is highly suitable for X Band applications which was confirmed using HFSS. The achieved peak gain and efficiency of the proposed antenna are 3.87 dBi and 85 % respectively.

Keywords: Flexible Antenna, Implantable Antenna, UWB, WiFi 6E, X Band, IoT

Paper ID: 390, TITLE: Fruit and Vegetable Classification Using transfer learning Techniques

Authors: Kumar Harsh, Vineeta Vineeta, Vipul Narayan and Pawan Kumar Mall

Abstract: Classification of fruits and vegetables can allow all agricultural product circulation connections to perform better inventory management, logistics planning, and supply chain coordination. This will increase the responsiveness and efficiency of the supply chain. The current classification of fruits and vegetables greatly relies on manual classification. Accurate classification plays an important role in food quality control, agricultural technology, and supply chain automation. The deep learning transfer learning approaches are implemented. The current working model incorporates human subjective elements into the process and develops errors and inaccurate assessments during fruit and vegetable classification. In this paper, the framework of transfer learning techniques for the classification of fruits and vegetables. This research work discusses the role of feature extraction and the role of transfer learning in improving the accuracy of the classification.

Keywords: Agricultural product, Classification, supply chain automation, Transfer learning, SDG

Paper ID: 394, TITLE: The Future of Cloud Security: Integrating Quantum-Resistant AI-Powered Solutions

Authors: Nandan Sharma and Ritul Agarwal

Abstract: The fast merging of quantum computing and artificial intelligence is bringing significant changes to cloud security. We must create new, quantum-secure approaches because quantum computers are set to crack the present encryption standards. At the same time, AI makes it easier to detect and manage threats, analyze unusual activity, and organize security in today's advanced cloud systems. In this paper, we present a way to implement cloud security by pairing post-quantum cryptography with the help of AI systems. It examines machine learning happening in predictive analysis, automated reaction, and secure system construction, together with methods to preserve data integrity in the future using quantum-safe encryption. The study demonstrates that hybridization could significantly improve enterprise and governmental systems as we prepare for a situation after quantum computing is uncovered.

Keywords: AI Powered Cloud Security, Cloud Security Automation, Machine Learning, Post Quantum Encryption

Paper ID: 397, TITLE: Intelligent Justice: AI - Driven digital forensics in fight against Cyber Crime

Authors: Akash Mishra, Nandini Bansod and Rachel Walters

Abstract: The increase in cybercrimes and massive growth of digital data has put a challenge for the investigators who depend on traditional digital forensics techniques which are time consuming, manual and not capable of handling modern-day data. The digital forensics is the method to identify, preserve, analyze and present the digital evidence. The ad-vanced cyberattacks have motivated the need of faster and intelligent methods. The paper attempts to study how Arti-ficial Intelligence plays a pivotal role in digital forensics by accelerating the process of digital forensics by making it efficient, accurate and scalable. The main aim of this pa-per is to compare the traditional forensic methods and methods where Artificial Intelligence has been integrated into the system and how the automation, machine learning and deep learning can help in quick extraction, classifica-tion and validation of the evidence. Descriptive and com-parative research methodology has been followed, and the focus has been on Artificial Intelligence based techniques like pattern recognition, Natural Language Processing (NLP) and Multiagent Systems (MAS). The paper also co-vers the Artificially Intelligent forensics tools and how these tools help with current digital forensics. The study also analyses the legal and ethical issues with the

evolving legal framework in India. The results would suggest that implementation of AI based digital forensics would drastically reduce the analysis time, dependency on humans would be minimized and automation would increase the reliability of the evidence by processing data in an intelligent way. There would be challenges like biased data sets, explainability and admissibility in the court. Hence the future of digital forensics would be in the hybrid framework where Artificial Intelligence would do the analytical part and humans would be there to provide transparency, accountability and legal defensibility in the forensic investigation.

Keywords: Artificial Intelligence, Digital forensics, Cybercrime Investigation, pattern recognition, deep-fake, deep learning.

Paper ID: 403, TITLE: Landmark-Based Real-Time Sign-to-Speech System Using MediaPipe and Lightweight Neural Models

Authors: Sachin Kumar Dhar Dwivedi, Shubham Sinha, Supriya Kumari, Anu Kumari and Prof Dr. Nitin Kumar Puri

Abstract: Sign language is an important communication method for individuals with speech and hearing impairments. However, to interpret sign language and provide meaningful communication, an individual still needs to provide 'real-time' interpretive assistance through the Internet using a device such as a smartphone. Current methodologies provide little real-world utility, largely because they rely on complex computer-vision-based process that require a significant amount of data storage/transfer and/or are limited by the availability of sophisticated hardware to run the model. The proposed research will develop a method that uses an intermediary step for converting static hand gestures into spoken words by employing a direct processing pipeline for real-time processing. Rather than requiring the entire frame image to process hand gestures, we will extract the 63 numerical components associated with the 21 points of interest, which are identified using the MediaPipe model. The numerical components will be used to train a compact TensorFlow/Keras model to categorize each gesture for rendering graphics using OpenCV and producing audio using gTTS. To assess real-world viability, a bespoke dataset comprising five frequently used gestures—Hello, Thanks, Yes, No, and I'm Good—was gathered using webcam-based collection. Despite changes in illumination, backdrop settings, and hand orientation, the system consistently operated at a pace of 25–30 frames

per second and achieved a recognition accuracy of 94–96 percent over several test sessions. These findings show that, in contrast to image-based CNN techniques, landmark-only features maintain strong discriminative strength while drastically lowering computing cost. The suggested pipeline eliminates the need for interpreters, sensors, or external devices and allows for quick sign-to-speech translation using only consumer-grade technology. Because of its modular design, it may be expanded to include offline voice creation, dynamic gestures, two-hand interactions, and embedded deployment. All things considered, the study is a useful step toward real-time assistive solutions that support accessibility and autonomy for people who use sign language for daily communication.

Keywords: MediaPipe, Sign Language Recognition, Hand Landmarks, Real-Time Gesture Detection, Lightweight Neural Networks, Gesture-to-Speech Conversion, Assistive Technology, TensorFlow/Keras, OpenCV, Human-Computer Interaction.

Paper ID: 407, TITLE: Machine Learning-Driven Detection of Alpha-Thalassemia Carriers Using Hematological Indices: A Comprehensive Experimental Study

Authors: Sheetal Chopra and Maninder Singh

Abstract: Alpha-thalassemia carriers often present with few clinical manifestations and their blood profiles appear similar to those of healthy individuals, thus making it difficult to identify them as such. While molecular testing is the most definitive option for diagnosis, the actual cost per patient makes molecular testing impractical as a universal option. Therefore, it is necessary to find a way to accurately screen for carriers of Alpha-thalassemia based on a routine complete blood count (CBC). To address this need, we developed a machine learning benchmark using historical patient data, i.e., 203 medical records and 14 blood indices, to create our predictive model. We tested ten machine learning algorithms, specifically Support Vector Machines (SVM) and Gradient Boosted Trees, and designed a multi-layer perceptron (MLP) neural network in PyTorch, as well as a Random Forest using an ensemble model. The statistical results indicated a considerable overlap, as evidenced by t-tests resulting in ($p > 0.05$) for almost all blood indices. Therefore, without additional information, most of the indices in isolation do not provide enough evidence for diagnosis. Overall, deep learning approaches did not succeed in providing sufficient prediction power when applied to this data, yielding an accuracy of only 0.42. However, Gradient Boosted Trees were shown to be more resilient to noise than

deep learning models. In this case, LightGBM yielded the best accuracy of 0.77. Our findings indicate that for patients diagnosed with mild thalassemia, Gradient Boosted Tree methods are superior to deep learning methods.

Keywords: Alpha-thalassemia, Hematological indices, Machine learning, Gradient boosting, Deep learning, Diagnostic screening, LightGBM, Complete Blood Count (CBC), Carrier detection, Ensemble learning

Paper ID: 409, TITLE: Design, Validation and Characterization Grain-128 AEADv2 Lightweight Crypto IP Core

Authors: Fathimathu Ruksana K K

Abstract: The need for low resource devices has significantly increased as a result of the development of Internet-of-things applications. Various light weighted stream cipher algorithms have emerged as promising solutions for securing IoT communications. They are used on hardware because of its simplicity, speed, limited resources and processing power. Lightweight cryptography overcomes these constraints by optimum utilization of the resources available, while maintaining security. Because of their economical implementations, 128aead ciphers stand out among other stream ciphers. In this paper, Design validation and characterization of grain128aead cipher IP core. The hardware platform used the Xilinx Artix-7 FPGA board and Vivado is used for simulations, syntheses, and implementations utilizing the Verilog hardware description language. The performance parameters results were observed with the help of Xilinx Vivado.

Keywords: Stream cipher, FPGA, grain128aeadv2, grain, Lightweight cipher

Paper ID: 411, TITLE: Comparative Analysis of Different Oxides for MoS2 Transistor

Authors: Shivangi Srivastava, Md. Ekrama Arshad and Sajal Agarwal

Abstract: The purpose of this study is to evaluate the performance of MoS2 transistor with different gate oxides. This paper systematically evaluates various performance parameters of transistors such as threshold voltage (V_{th}), ON/OFF ratio, and maximum drain current. This comprehensive analysis is done using six different oxides namely silicon dioxide

(SiO₂), hafnium oxide (HfO₂), lanthanum oxide (La₂O₃), Strontium zirconium oxide (SrZrOx), composite of PMMA:SrZrOx and titanium dioxide (TiO₂) for a back-gate device. Results of the paper suggest that SrZrOx exhibits better performance with lower V_{th} is -0.4 V along with ON/OFF ratio and maximum I_d are 10¹³ and 662.57 μ A. This device with relatively higher ON/OFF ratio and lower V_{th} demonstrates superior switching performance, energy efficiency, and reliability. They are well-suited for wide range of real-time applications.

Keywords: MoS₂, High-k dielectric, gate oxides

Paper ID: 412, TITLE: Real-Time Task Offloading and Resource Allocation in Vehicular Fog Computing for Autonomous and Intelligent Transportation Systems: A Survey

Authors: Mridul Pachani, Dr Sarwan Singh and Rintu Das

Abstract: Vehicular Fog Computing (VFC) puts computing, storage, and intelligence in close proximity to vehicles by leveraging RSUs, edge servers, and resource-capable vehicles to meet the demanding latency, reliability, and bandwidth requirements of current ITS and autonomous driving functions. The presence of VFC mitigates the cloud-centric limitations by allowing local offloading, cooperative processing, and context-aware resource orchestration. These are essential for real-time perception, cooperative localization, and safety-critical control loops in their tasks. This review synthesizes more than eighty studies across task offloading, resource allocation, and optimization methodologies-from classical convex programming to DRL, game theory, and metaheuristics-while integrating emerging paradigms like federated learning (FL), permissioned blockchain for trust, and 5G/6G network slicing; it highlights hybrid optimization as a high-performing direction and outlines open research gaps in scalability, privacy, and standardization. [1][6]

Keywords: Vehicular Fog Computing, Task Offloading, Federated Learning, Deep Reinforcement Learning

Paper ID: 415, TITLE: AI-Based Intrusion Detection Systems for Industrial Control Systems: A Review

Authors: Raminder Singh, Ankush Azaad, Akash Sharn, Muneer Ahmed Dar and Abhinav Mishra Mishra

Abstract: The operational support of critical infrastructure is an element of the Industrial Control Systems (ICS) that combine physical processes with cyber networks that handle real-time monitoring and control of the environment. Nevertheless, the growing dependency of ICS with enterprise and cloud environments has also opened them to the advanced cyber threats. To overcome such problems, Intrusion Detection Systems (IDS) with the use of Artificial Intelligence (AI) have become an essential part of industrial cybersecurity. The current paper gives a review of 26 state-of-the-art works published in 2020-2025, with the topic of application of Machine Learning (ML), Deep Learning (DL), Explainable Artificial Intelligence (XAI), Federated Learning (FL), and Adversarial Defense in ICS environment. These approaches are not only classified according to methodology, datasets, detection accuracy, interpretability, and deployment feasibility in the review. It also determines existing constraints in dataset variety, scaling, elucidation, and strength and elaborates cross-cutting issues influencing the application in the real world. Lastly, the paper identifies the current trends and future development of research on explainable, lightweight, and resilient AI systems that can be used to provide reliable and scalable security to the industrial ecosystems of the next generation.

Keywords: Intrusion Detection Systems (IDS), Process-Aware IDS, Federated Learning (FL), Explainable Artificial Intelligence (XAI), Deep Learning (DL), Adversarial Robustness, Critical Infrastructure Security, Industrial Control Systems (ICS)

Paper ID: 417, TITLE: Deep Learning–Driven Mango Leaf Disease Classification with EfficientNet-B0

Authors: Sheela Singh, Pawan Kumar Mall and Swapnita Srivastava

Abstract: The identification of plant diseases plays a vital role in taking disease control measures to improve the quality and quantity of crop yield. Automation of plant diseases is very beneficial as it reduces the monitoring work in large farms. Leaves being the food source for plants, the early and accurate detection of leaf diseases is important. This work

presents the application of EfficientNet-B0 for automatic classification of mango leaf diseases. Several foliar diseases, during the life cycle of mango production, occur. With manual inspection, it is not possible to detect this disease in its early stage. The approach proposed in the present work offers a very good trade-off between high accuracy of classification and computational efficiency for an agricultural environment, enabling its adoption on mobile and edge devices. Experimental results demonstrated the model's ability to identify multiple categories of diseases from the images of leaves.

Keywords: Mango leaf disease classification, Deep learning, EfficientNet-B0, SDG, transfer learning

Paper ID: 418, TITLE: AI Driven Multi Oral Pathology Scanner using Deep learning and Image Processing

Authors: Manoj Kumar, Pranav Puri and Prashant Gupta

Abstract: Oral health problems such as tooth decay, periodontal disease, oral cancer and dental clothing are often unnoticed to them until reached advanced stages, largely due to fragmented diagnostic tools and limited access to care - especially in rural and underrated areas. This article presents an integrated solution: a multi-oral disease scanner that combines a compact intraoral imaging device with a conventionally neural network (CNN) trained on panoramic X-rays and clinical datasets. The system is designed to detect several conditions in a single scan, and identify structural changes, soft tissue deviations and early stage lesions through multi-label classification. The modular layout allows targeted analysis, including caries detection, periodontal pocket measurement, lesion segmentation and occlusal wear graduation. In addition to structural and surface level diagnostics, the proposed system has the ability to detect viral infections, neurological disorders, autoimmune conditions and systemic diseases through oral biomarkers and tissue pattern recognition-and expand the use beyond traditional dental treatment. To ensure usefulness in low resource settings, the scanner supports offline AI inference, multilingual interface and maintains compliance with India's Digital Personal Data Protection (DPDP) Act. By putting together different diagnostic abilities into an available platform, this research aims to promote early detection and make oral health care more embracing affordable and preventative.

Keywords: Multi oral disease scanner, Oral biomarker, AI in dentistry, Systemic disease detection, Oral cancer screening, Lesion segmentation, Dental caries identification, Periodontal disease detection, Early disease detection, Multi-label classification, Panoram.

Paper ID: 420, TITLE: ARTIFICIAL INTELLIGENCE-BASED LOGISTICS AND DRONE SIMULATION (AIBL-DS) BATTLEFIELD

Authors: Prabjyot Singh and Vidya Arnav

Abstract: The incorporation of drones into multi-agent frameworks has become a key method for improving battlefield logistics, surveillance and strategic decisions. This study introduces AIBL-DS Battlefield, a simulation tool built with Python and Streamlit that replicates the interactions among delivery drones, reconnaissance drones and adversarial agents, within a grid setting. The platform enables live visualization of -agent dynamics, task distribution, route optimization and obstacle evasion. Through the integration of -agent control strategies, probabilistic motion models and interactive dashboards the simulation offers understanding into performance indicators, like supply transport, threat evasion and operational collaboration. The platform emphasizes the value of open-source instruments, for education, research and operational planning. By modeling battlefield scenarios, it allows for the evaluation of strategies that would be expensive or dangerous to test in reality. Experimental findings show that drones can effectively adjust to changing troop requirements evade dangers and enhance delivery timetables amid environmental and operational limitations. Moreover, the simulation offers a foundation for investigating swarm dynamics decision-making amid uncertainty and collaboration in hostile environments. This study establishes the groundwork for research in autonomous battlefield logistics and supplies a model, for examining drone swarm actions in changing adversarial contexts.

Keywords: Multi-Agent Systems, Drone Simulation, Battlefield Logistics, Python, Streamlit, Autonomous Agents, Obstacle Avoidance, Real-Time Visualization, Swarm Intelligence, Adaptive Path Planning.

Paper ID: 423, TITLE: Triple-Band Patch Antenna with Dual-Band Circular Polarization for 5G mmWave Applications

Authors: Mohammad Hannan, Faizan Shafi, Prashant Gupta, Kahkashan Kouser, Mohammad Aknan and Braj Kishore Jha

Abstract: A compact multiband microstrip patch antenna is presented for millimeter-wave (mmWave) 5G communication systems. The proposed antenna operates efficiently at 26.4 GHz, 28.5 GHz, and 32.7 GHz—covering key frequency allocations defined for 5G new radio (NR) bands. Through meticulous geometric optimization, the antenna achieves stable impedance matching and consistent multiband performance while maintaining a miniaturized structure suitable for integration in next-generation wireless devices. Simulated results demonstrate a return loss better than -20 dB and a voltage standing wave ratio (VSWR) below 2 across all operating bands. The design exhibits a peak gain exceeding 6 dB, radiation efficiency above 90%, and total efficiency greater than 85% at each resonance. Furthermore, circular polarization with an axial ratio below 3 dB is realized at 26.4 GHz and 32.7 GHz, whereas linear polarization is observed at 28.5 GHz, providing polarization diversity for robust 5G connectivity. Owing to its compact size, high radiation efficiency, and dual-polarization capability, the proposed antenna offers an effective solution for high-performance mmWave front-end modules in emerging 5G communication systems.

Keywords: 5G, Patch antenna, Millimeter-Wave, Voltage standing wave ratio, Circular Polarization, Reflection Coefficient

Paper ID: 426, TITLE: Intelligent SLA-Aware Network Virtualization Using Adaptive Link Aggregation on KVM in Multi-Tenant Cloud Environments

Authors: Abhinav Mishra, Sandeep Pati Tripathi, Akash Sharan, Shweta Verma and Ajay Verma

Abstract: Abstract With the growth of multi-tenant cloud environments, ensuring equitable bandwidth distribution and meeting Service Level Agreements (SLAs) becomes increasingly critical. This paper introduces an intelligent SLA aware network virtualization architecture utilizing adaptive link aggregation (bonding and teaming) on Kernel based Virtual Machine (KVM) platforms. By dynamically adjusting traffic routing based on

workload demands and SLA specifications, our approach ensures enhanced throughput, guarantees increased throughput, fairness, and reduced latency. Experimental results demonstrate performance improvements in bandwidth management, reliability, and SLA adherence, supported by comparative analysis with static aggregation methods. The core of the framework is an adaptive aggregation engine that leverages Linux bonding/team drivers, tc-based traffic shaping, and a hybrid Token-Bucket + Weighted Round Robin (WRR) algorithm. SLA parameters—such as minimum guaranteed bandwidth, latency, and jitter—are continuously monitored and enforced using a real-time controller that adjusts traffic allocation based on workload variations. Flow classification using iptables and tc filters enables per-tenant prioritization, while monitoring tools such as Netdata and Prometheus supply continuous telemetry for closed-loop control. Experimental evaluation on a KVM testbed with bonded NICs (802.3ad LACP) and synthetic workloads generated using iperf3 demonstrates significant performance improvements. Compared with static aggregation, the adaptive method achieves higher throughput (up to 40% for low-priority tenants), reduces SLA violation rates by more than 75% for high-priority tenants, and improves link utilization by 22%. The approach effectively bridges the gap between policy-level SLA management and host-level network control, offering a deployable solution suitable for modern cloud platforms. By bridging the gap between policy level SLA definitions and host level network control, the proposed solution offers a practical, deployable approach for cloud operators seeking predictable performance in multi-tenant infrastructures. The framework is extensible to SDN/NFV ecosystems and future enhancements may include AI-based traffic forecasting, Kubernetes/OpenStack integration, and eBPF/XDP-based acceleration.

Keywords: SLA aware networking, KVM, Network Virtualization, Adaptive Link Aggregation, Cloud, Bonding, Teaming, Multi-Tenant, Quality of Service (QoS), Throughput, Token-Bucket, Weighted Round Robin (WRR).

Paper ID: 427, TITLE: Autonomous Detection and Classification of Pulmonary Nodule using Machine Learning with Mobile Deployment

Authors: Sushil Agrawal and Shrey Agrawal

Abstract: Pulmonary Nodules are oval-shaped growth found in the lungs. These growths may or may not be cancerous. False detection of these nodules can have adverse effect on

the patient. Detecting these nodules in its early stages can increase the chance of survival. Nowadays, Computer Tomography (CT) is widely used for its improved imaging and efficiency. However, the problem merges due to the time constraint in the detection of these nodules and the human error in classifying them as malignant or benign. Hence a Pulmonary Nodule Detection and Classification System uses Image processing techniques to detect the nodules present in the CT scan image. The Image processing procedure covers acquisition, pre-processing, segmentation and feature extraction. Malignancy of the nodule is determined from its density measured in Hounsfield units(HU). Machine Learning helps in classifying the nodules into stages. If it is nodule is malignant, it classifies into different stages. The aim is to improve the system accuracy by using different segmentations and classifiers.

Keywords: CT, PNDS, SVM, MLP, Feature Extraction

Paper ID: 433, TITLE: A New Lightweight ECC-Based Protocol for Secure, Low-Overhead Distributed Wireless Systems

Authors: Ajaz Ahmad Kumar, Syed Mufassir Yaseen, Iraq Ahmad Reshi and Ummer Iqbal Khan

Abstract: Secure encryption is difficult because IoT devices and distributed wireless systems frequently work under stringent energy, processing power, and communication bandwidth constraints. In order to solve this, we provide EAEA-ECC, an adaptive elliptic-curve cryptography configuration that is energy-aware and capable of real-time security strength adjustment. EAEA-ECC chooses curves, adjusts key sizes, and can switch to symmetric AEAD modes depending on the device's resource condition, in contrast to static ECC schemes. In addition to a monitoring module that keeps track of energy, compute, and communication expenses, the architecture is complemented by workflow and activity diagrams that show how it behaves during runtime. In comparison to RSA-1024, ECC-256, and Curve25519, experiments on ATmega328P, ESP32, and Raspberry Pi 4 demonstrate significant improvements: a 40–78 % reduction in compute, up to 72% reduced energy consumption, and network lifespan benefits of up to 196% . The method also lowers communication overhead while maintaining forward secrecy and data integrity thanks to various key sizes (128–256 bits). These results confirm that EAEA-ECC provides a scalable, safe, and effective solution for IoT, CPS, and 5G-oriented networks.

Keywords: Lightweight Cryptography, ECC, IoT, Security, Adaptive Encryption

Paper ID: 438, TITLE: Bridging Post-COVID Skill Gaps in the IECT Industry: A Multi-Layer Capability Framework and Stakeholder Roadmap

Authors: Prashant Gupta, Indulata Gupta and Rajneesh Kumar Asthana

Abstract: The COVID-19 crisis substantially accelerated digital adoption across the Information, Electronics, and Communication Technology (IECT) sector, thereby intensifying existing skill shortages in domains like cloud technologies, cybersecurity, artificial intelligence and machine learning, embedded systems, 5G networks, data analytics, basic digital skills, as well as hybrid-work abilities including virtual collaboration and agile decision-making. This study consolidates international and India-centric findings to develop a structured taxonomy of these skill gaps, linking them to factors such as outdated curricula, fast-paced Industry 4.0 advancements, pandemic-related setbacks in education and internships, and persistent digital inequalities particularly affecting women and rural learners. To address these challenges, the paper presents a layered capability framework, categorizing competencies into foundational, intermediate, advanced technical, and soft-skill tiers, while also identifying system-level enablers like supportive policies, curriculum modernization, industry-driven learning ecosystems, and inclusive digital infrastructure. The roles of key stakeholders are clarified—government initiatives like Digital India in driving skilling programs, educational institutions in adopting hands-on pedagogy, industries in facilitating reskilling, and civil society in outreach and awareness. The proposed framework leads to practical strategies for adaptive policymaking, experiential training, continuous professional development, and inclusive interventions aimed at building a robust and diverse IECT talent pool equipped for sustained growth in the post-pandemic era.

Keywords: Skill gap, IECT industry, Post-COVID, Digital transformation, Industry 4.0, Digital skills, Reskilling, Upskilling, Digital India, Cybersecurity, Embedded systems, Digital divide, AI/ML

Paper ID: 442, TITLE: The Convergence of Artificial Intelligence and CRISPR-Cas9: A Review of Innovations, Challenges, and Future Vistas in Genome Editing

Authors: Muskan Kirar, Palak Sobti, Akash Sharan, Abhinav Mishra and Shaweta Sharma

Abstract: CRISPR-Cas9 has emerged as a revolutionary gene editing+ technology, offering unprecedented precision in modifying the genetic code and opening new frontiers in molecular medicine. Concurrently, Artificial Intelligence (AI) has established itself as a transformative force in biomedical science, capable of interpreting vast and complex datasets to forecast outcomes and refine therapeutic strategies. This synergy promises to enhance the precision, efficacy, and safety of genome edit-ing, moving the field from a process of trial-and-error to a predictive, design ori-ented science. In this paper, we provide a comprehensive review of how AI is be-ing integrated with CRIS PRS9 to address its central challenges. We will place a particular focus on applications in cancer therapy, where the need for highly spe-cific and predictable genetic interventions is paramount. In addition, we will dis-cuss the persistent challenges, promising future directions, and the critical ethical considerations that will shape the responsible development of this powerful tech-nological fusion.

Keywords: Artificial Intelligence (AI), Bioinformatics, Cancer Therapy, CRISPR-Cas9, Deep Learning, Genome Editing, Guide RNA (gRNA), Optimization, Machine Learning, Off-Target Prediction, On-Target Efficiency, Precision Oncology, Syn-thetic Lethality.

Paper ID: 443, TITLE: Real-Time Crowd Classification Using Deep Convolutional Neural Networks with Data Augmentation for Enhanced Public Safety

Authors: Saksham Sharma, Disha Saini, Aman Singh and Kartik Vats

Abstract: Crowd management is one of the most important aspects of human society, aimed at protecting the lives of citizens. This study presents a comprehensive evaluation of Convolutional Neural Network (CNN) architectures for classifying images in-to Crowded and Uncrowded categories. Among the non-augmented models, the three-layer CNN (CNN3) achieves the highest accuracy (0.82), macro F1-score (0.82), and AUC (0.88), demonstrating superior discriminatory capability. Data augmentation improves robustness, particularly for the Crowded class, with CNN2 + Augmentation achieving a

recall of 0.87 and CNN3 + Augmentation maintaining a strong AUC of 0.82. While augmentation slightly reduces peak accuracy, it enhances class balance and generalisation across the datasets. ROC curve analysis further confirms the superior performance of deeper architectures, with three-layer Sigmoid-based models outperforming two-layer counterparts. Overall, the results highlight that the three-layer CNN with Sigmoid activation provides a robust baseline, and augmented versions deliver enhanced generalisation and class-balanced performance, making them well-suited for practical real-time crowd-classification applications.

Keywords: Crowd Management, CNN, Image Processing, Data Augmentation, Public Safety, IoT.

Paper ID: 446, TITLE: Advances in AI-Enabled Predictive Maintenance: Models, Industrial Application, and Research Frontiers

Authors: Prafull Dhole, Ankit Manderna and Shraddha Wangujare

Abstract: The industrial landscape is currently navigating a pivotal transition from reactive and preventive maintenance strategies to Predictive Maintenance (PdM), a paradigm empowered by the convergence of Artificial Intelligence (AI), the Industrial Internet of Things (IIoT), and advanced data analytics. This shift facilitates a move from fail-and-fix methodologies to predict-and-prevent strategies, thereby optimizing asset availability, reducing operational expenditures, and enhancing safety. This paper explores the state-of-the-art in AI-enabled PdM, providing a deep technical analysis of deep learning architectures including Convolutional Neural Networks (CNNs), Long Short-Term Memory (LSTM) networks, Autoencoders, and the emerging Transformer models. It critically examines the application of these models across key sectors, with specific attention paid to energy systems, thermal power generation, and rotating machinery—areas where thermodynamic efficiency and exergy analysis are critical. Furthermore, the paper identifies and discusses emerging research frontiers such as Physics-Informed Machine Learning (PIML), Digital Twins, and Explainable AI (XAI), addressing persistent challenges regarding data scarcity, model interpretability, and cybersecurity in safety-critical environments.

Keywords: Predictive Maintenance (PdM), Artificial Intelligence (AI), Industrial Internet of Things (IIoT), Deep Learning, Convolutional Neural Networks (CNNs), Long Short-Term Memory (LSTM) Networks, Autoencoders, Transformer Models, Energy Syste

Paper ID: 447, TITLE: AI-Driven Cost Optimization in AWS

Authors: Yunus Israr, Abhijeet Singh and Anita Budhiraja

Abstract: Cloud computing has reshaped modern enterprise operations by offering scalable, on-demand infrastructure, with Amazon Web Services (AWS) being a leading provider. While AWS delivers flexibility and performance benefits, its dynamic and consumption-based pricing structure frequently results in uncertainty for organizations seeking accurate financial planning. This study presents a machine learning-driven framework designed to predict monthly AWS expenditure and support strategic cost optimization. Historical pipeline execution logs are analyzed to extract cost-driving attributes such as instance type, runtime, and resource utilization. Multiple predictive models, including Random Forest, Extreme Gradient Boosting, and long short-term memory networks, are evaluated, with XGBoost achieving the lowest root mean square error of 3.92. Beyond forecasting, the framework integrates anomaly detection and service-level optimization to identify redundant cloud components and recommend configuration adjustments. The outcome improves operational efficiency, informs budgeting, and strengthens cloud security through automated tool recommendations. The findings suggest that machine learning offers tangible value for cost governance and service management within AWS environments. Future expansion includes real-time deployment using AWS Lambda and Sage-Maker, multi-cloud applicability, advanced deep learning architectures, and intelligent reinforcement learning-based optimization to enhance automation and decision support.

Keywords: AWS cost prediction, machine learning, XGBoost, cloud cost optimization, anomaly detection, cloud security, service recommendation, predictive analytics, cost governance, FinOps.

Paper ID: 448, TITLE: Hardware Implementation of a High-Precision Fixed-Point MAC for Biomedical Application

Authors: Himanshu Verma, Anand N, Yogesh Kakasaheb Shejwal and Jayraja U. Kidav

Abstract: Biomedical signal processing for implantable and wearable technology imposes a crucial design conundrum: operating within strict power and area constraints while obtaining the numerical precision required for clinical validity. With an emphasis on applications like ECG, EMG, and EEG processing, this paper offers a thorough analysis of high-precision Fixed-Point Multiply-Accumulate (MAC) architectures as the key solution to this problem. First, we determine the precision-quantization trade-off by examining the signal-to-noise ratio (SNR) and dynamic range requirements of important biomedical algorithms, such as wavelet transforms, adaptive filters, and lightweight neural networks. Although floating-point units offer inherent dynamic range, optimised fixed-point alternatives are required due to their excessive resource costs. Three axes are used in our review to systematically classify and evaluate MAC architectures: accumulation strategies (guard bits, extended-precision adders), computational core (modified Booth encoding, Wallace/Dadda trees), and system-level optimisation (bit-serial processing, precision-scalable units). We assess their implementation effectiveness and suitability for both ASIC (for ultimate power/area optimisation) and FPGA (for rapid prototyping) targets. With the help of case studies that quantify the effects of MAC architecture decisions on diagnostic metrics like detection sensitivity and feature extraction accuracy in real-time biomedical systems, the paper ends with a synthesis of co-design approaches that connect algorithm development and hardware implementation. The goal of this review is to give researchers and engineers a unified framework for designing effective, high-fidelity signal processing cores for the upcoming generation of autonomous medical devices.

Keywords: Fixed-Point Arithmetic, Multiply-Accumulate (MAC) Unit, Biomedical Signal Processing, Low-Power VLSI Design, Hardware Acceleration, FPGA/ASIC Implementation, Precision-Quantization Trade-off, Wearable Medical Devices, Hardware/Algorithm Co-Design, Digital

Paper ID: 450, TITLE: Benchmarking Deep Learning in Brain Tumour Imaging: Segmentation, Classification, and Emerging Techniques

Authors: Ramya Katukojwala, Yogesh Kakasaheb Shejwal and Shraddha P. Wangujare

Abstract: The accurate and timely analysis of cerebral tumours by means of medical imaging is indispensable for a correct diagnosis, the best therapeutic planning and for the prognosis. The advent of Deep Learning (DL) has changed this field by providing automated and high-precision tools for tasks such as tumour segmentation and classification. This review attempts to perform a systematic benchmarking of the current DL architectures for these principal tasks, providing a comparative evaluation of the relative strengths, limitations and potential applicability of these architectures. The paper does a thorough survey of the seminal and current literature, focusing on Convolutional Neural Networks (CNNs), Fully Convolutional Networks (FCNs) (e.g. U-Net and its derivatives), and Transformer-based models for multimodal brain Magnetic Resonance Imaging (MRI) (e.g. T1, T1c, T2, FLAIR) datasets. Benchmarking is performed against common public benchmark datasets, in particular, BraTS, and the metrics Dice Similarity Coefficient (DSC) for segmentation, and accuracy and sensitivity for classification. The results show that encoder-decoder architectures (such as U-Net) with advanced features (such as attention gates, and residual connections) are currently providing the highest consensus Dice scores (greater than 0.85-0.90 for whole tumour) available in segmentation. In terms of classification, hybrid models of fusing CNN feature extractors with sequential or attention-based classifiers have good performance in tumour grading and genotype prediction. Nevertheless, there are still a number of important issues remaining, including the model generalizability with heterogeneous clinical datasets, the interpretability of the predictions, and the combination of multimodal clinical information. Even though the current models analyzed for the benchmarking are accurate we need more improved systems for development of explainable, data-efficient and clinically-integrated systems. Future studies should therefore investigate the potential of foundation models, federated learning for privacy preserving multi-institutional training as well as the combination of radiomics and genomic data.

Keywords: Brain Tumour, Deep Learning, Medical Image Segmentation, Magnetic Resonance Imaging (MRI), Benchmarking, U-Net, Transformers, BraTs

Paper ID: 451, TITLE: A Comprehensive Review of FPGA-Based power Efficient Arithmetic Logic Units using Carry-save Arithmetic synthesis, analysis and comparative Insights

Authors: Vaishali Bharati, Yogesh Kakasaheb Shejwal, Anand N and Jayraj U. Kidav

Abstract: The unremitting requirement on high-performance and energy efficient computing in embedded systems, digital signal processing (DSP), and cryptographic applications has fuelled the need of optimized Arithmetic Logic Unit (ALUs). Field-Programmable Gate Arrays (FPGAs) provide a program mable platform that is suitable to deploy application specific ALU structure. Carry-Save Arithmetic (CSA) of various optimization approaches has become one of the key approaches to optimizing the speed and power usage of arithmetic circuits, especially in multiple-operand operations such as accumulation and multiplication. In this paper, the authors provide a review of the power-efficient ALU designs that are based on carry-save arithmetic and use FPGA. We perform an analytical methodology of synthesis methodologies, architecture variants and optimization strategies that have been used to include CSA in the ALU datapaths. An in-depth analysis of power, performance and area (PPA) trade offs with particular attention to dynamic reduction of power by minimizing glitching and critical path delays is discussed in the review. Moreover, we provide comparative data about modern-day designs, comparing them to traditional binary arithmetic designs in the throughput, latency, logic usage, and on-chip power dissipation. Important issues like design complexity, verification costs and how to interface CSA units with standard logic are addressed extremely. Lastly, the paper provides a note of future research, such as the synergy between CSA and approximate computing, CSA use as a low-voltage operation in FPGAs, and CSA-based datapath generation using automated high-level synthesis tools. The goal of this survey is to be a reference point to a researcher and engineer as they think of the next generation of power-constrained, and yet, arithmetic systems on reconfigurable hardware.

Keywords: Arithmetic Logic Unit (ALU), Carry-Save Adder (CSA), Field Programmable Gate Array (FPGA), Power-Efficient Design, Low-Power VLSI, Digital Arithmetic, High-Performance Computing, Logic Synthesis, Comparative Analysis

Paper ID: 454, TITLE: Internet of Things Intrusion Detection Using the CIC IoT Dataset 2023: Comprehensive Analysis and Machine Learning Approaches

Authors: Gom Taye, Marpe Sora and Rintu Das

Abstract: The Internet of Things has become common infrastructure in recent years, from consumer electronics to smart cities, healthcare systems, and industrial settings. Although there are undeniable advantages to this expansion, there are also significant security risks. In reality, a lot of IoT devices are set up with little security support, little processing power, and a wide range of network configurations, all of which make them vulnerable to cyberattacks. Because the CIC IoT Dataset 2023 includes comprehensive traffic records that show both legitimate activity and various attack types across various IoT settings, it offers a practical basis for researching security vulnerabilities in IoT networks. Our work investigates intrusion detection systems for Internet of Things environments using this dataset, focusing on machine learning-based models, ensemble techniques, and their useful behavior in actual installations. The findings support the application of advanced machine learning techniques, particularly ensemble methods, in real-world IoT systems by indicating that they can achieve detection accuracies exceeding 99 percent while maintaining an acceptable number of false positives [1][2].

Keywords: CICIoTDataset2023, IDS, Machine Learning, Deep Learning, Security, Attack

Paper ID: 465, TITLE: Dynamic Cipher Selection and Per-Message Key Derivation for Securing Resource-Constrained UAV Systems

Authors: Doha Ayoub, Aqsa Mir, Sumaya Akhtar, Fayaz Ahmad Fayaz and Ummer Iqbal Khan

Abstract: The fast use of Unmanned Aerial Vehicles in commercial and defense has increased, and demand for secure communication channels between UAVs and GCS is required. MAVLink is a lightweight and commonly used UAV telemetry protocol but lacks built-in encryption and has limited integrity protection, therefore making UAVs vulnerable to eavesdropping, spoofing, and replay attacks. This paper proposes a Lightweight Hybrid Cryptographic Enforcement (LHCE) framework, which will integrate Elliptic Curve Cryptography for mutual authentication and key agreement, AES GCM for confidentiality and integrity for all MAVLink messages, and a 64-bit Extended Sequence Number

mechanism to protect from replay attacks. The framework is implemented on a Raspberry Pi companion computer interfaced with a Pixhawk flight controller with suitability to most existing UAV architectures. The experimental evaluations performed show that LHCE introduces less than 8% latency overhead while considerably improving communication security. These results have shown strong resilience against eavesdropping, tampering, and replay attacks, hence confirming LHCE as a practical security enhancement for real-time UAV operations.

Keywords: UAVs, MAVLink, LHCE, Pixhawk.

Paper ID: 471, TITLE: A Hybrid Context-Aware Sensitive Information Detection for an unstructured text

Authors: Velentina Longjam

Abstract: The digital communication tools are being widely used, and they have offered more chances of unintentional exposure of sensitive information. To resolve this issue, this study proposes a hybrid BERT and CRF architecture in automatic detection of sensitive and non-sensitive components of unstructured text. An annotated Twitter dataset was applied to test performance of the model with three learning rates i.e 1e-5, 3e-5, and 5e-4. The experiment performance demonstrates that the model is always highly precise at the range of 0.98 to 0.99 with the F1-scores up to 0.99 with all learning rates, which indicates the recognition stability of normal content. The best results of the model for Sensitive class were 5e-4 learning rate with a Precision = 0.99, Recall = 0.98 and F1 = 0.98, which gained a good result in identifying sensitive entities with few false positives and false negatives. There was less recall of the Sensitive class under lower learning rates 1e-5 and 3e-5. The results confirm that the hybrid BERT-CRF model, when optimized with an appropriate learning rate, provides a highly effective solution for sensitive information detection, achieving strong generalization and balanced performance across both classes.

Keywords: Sensitive Information, BERT, CRF, Machine Learning, Deep Learning, Context- Aware, Tweets

Paper ID: 472, TITLE: A Comparative Study of Indoor Kitchen Air Quality and Outdoor Ambient Air Quality

Authors: Saksham Verma, Dheeraj Aggarwal, Krishna Kumar, Prateek Dhar Dwivedi and Prakash Pratik

Abstract: Air quality has become one of the major environmental and public health concerns, particularly for women who have been frequently exposed to pollutants generated during cooking activities in India, almost half of their time spent in the kitchen. Indoor Air Quality (IAQ) in poorly ventilated kitchen environments often deteriorates due to emissions from fuel combustion and food preparation processes. This study utilizes an Internet of Things (IoT)-based monitoring system—integrating the ESP8266 microcontroller with MQ-series gas sensors—to compare and analyze air quality variations in a communal hostel kitchen. Key pollutants measured include Carbon Monoxide (CO), Carbon Dioxide (CO₂), Volatile Organic Compounds (VOCs). The findings reveal distinct pollutant peaks during morning and evening cooking hours, with concentrations strongly influenced by cooking intensity, fuel type, and ventilation practices. These pollutant spikes frequently exceeded recommended exposure limits, especially in conditions where windows and exhaust systems were not properly used. The data aligns with global research highlighting the adverse health effects associated with prolonged exposure to PM_{2.5}, CO, and VOCs, such as respiratory illnesses, reduced cognitive performance, and increased risk of chronic diseases. Women, who traditionally spend more time in kitchen environments, face higher exposure and related health risks. By integrating IoT-based real-time monitoring with comparative analysis of several studies, this research draws attention to the need for improved ventilation, deployment of low-emission cooking technologies, and enhanced user awareness in shared living spaces. The study provides evidence-based recommendations for policymakers and institutions to implement cost-effective IAQ interventions, ensuring healthier kitchen environments and reducing pollution-related health burdens.

Keywords: IAQ(Indoor Air Quality), PM2.5, Carbon Monoxide

Paper ID: 474, TITLE: Simulation-Driven AI-IoT Framework for Early Detection of Pump and Pipeline Faults in Rural Water Distribution Networks

Authors: Ravi Kumar Burman, Sachin Kumar Dhar Dwivedi, Bheem Kumar, Shubham Sinha and Abhishek Kumar

Abstract: Reliable drinking-water delivery in rural regions continues to rely on distributed infrastructure that is difficult to monitor and susceptible to mechanical failures that often remain undetected until service interruption occurs. Although networked sensing and machine-learning approaches have advanced fault diagnosis in urban distribution systems, comparable deployment in rural supply remains constrained by cost, intermittent connectivity, and limited technical supervision. This study introduces an AI-augmented Internet of Things framework that integrates continuous flow, pressure, and vibration sensing with data-centric fault prediction models to identify early signatures of pump and pipeline degradation. Synthetic operational data were generated using hydraulic simulation to reproduce normal and degraded operating conditions, including pump efficiency loss, leakage, and pressure decline. Low-power sensor nodes report measurements to an edge–cloud architecture configured for near-real-time inference. Simulation-based evaluation across representative degradation scenarios showed that the proposed approach increased early-fault detection accuracy by 18–26 percent and extended warning lead time by two to four operating cycles relative to threshold-based monitoring, while keeping false-alert frequency within tolerable limits. These results indicate that coupling simulated hydraulic patterns with predictive analytics offers a practical pathway toward reducing unplanned downtime and strengthening water-service reliability in resource-constrained rural settings.

Keywords: Simulation-driven modelling, AI-IoT integration, predictive maintenance, hydraulic fault detection, rural water distribution, edge–cloud inference, synthetic operational data

Paper ID: 475, TITLE: Survey on Energy Optimization in Wireless Sensor Networks via Efficient Routing Protocols

Authors: Anil Kumar Maurya, Richa Agrawal and Shiva Dwivedi

Abstract: Wireless Sensor Networks (WSNs) have emerged as fundamental infrastructure in numerous application domains, including environmental monitoring, industrial

automation, military surveillance, and smart cities. The primary challenge impeding the scalability and longevity of WSNs is energy consumption, primarily dictated by strategies for energy optimization in WSNs with a focus on efficient routing protocols. Drawing on recent studies, including semantic-based detection systems, adaptive sensor selection using machine learning, comparative chipset analyses, and robust security frameworks, this survey critically evaluates methodologies for minimizing energy expenditure while maintaining data reliability and network robustness. The survey further explores the interplay between data quality, security, and routing efficiency, elucidating how holistic protocol design can address the multidimensional constraints of modern WSN deployments. Afterwards, the paper provides a summary of the issues surrounding power usage, underscoring the importance of creative solutions to prolong the network's longevity. An extensive section of the study delves into various energy-efficient protocols and algorithms aimed at improving data collection in Wireless Sensor Networks (WSNs). The paper classifies these approaches according to their strategies for forming clusters, communication protocols, and optimization algorithms.

Keywords: Wireless Sensor, Networks Energy Optimization, Routing Protocol

Paper ID: 479, TITLE: AI-Driven Cybersecurity: A Comprehensive Review of Modern Threat Detection and Intelligent Defense Mechanisms

Authors: Sudhir Kumar, Jeetendra Kumar Singh, Kapil Gulati and Simran Taneja

Abstract: This study assesses the growing complexity and diversity of unpredictable cyberattacks, which increasingly take advantage of the shortcomings of traditional signature-based defense mechanisms mainly thought to detect known threats. The analysis suggests that cybersecurity is increasingly moving towards the use of reactive AI systems, which operate in a similar way as the human immune system by identifying an attack, making real-time responses, and accommodating new threat patterns. This review explores major methods, such as reinforcement learning, multi-agent system, and deception-based defense methods, which are aimed at strengthening modern security infrastructures. However, these approaches come with several challenges, including instability of the model, dangerous safe autonomous detection methods, explainability limitations, and challenges in the integration of heterogeneous IT environments. Consequently, in this study, we present a number of future research directions such as

protective-reactive hybrid architectures, secure real-time explainable AI mechanisms, as well as evaluation and test-ing standard frameworks. Overall, the review emphasizes that there needs to be transparency and ethics surrounding the use of AI in cybersecurity.

Keywords: Artificial Intelligence (AI), Cybersecurity, Deep Learning, Machine Learning, Multi-Agent Systems, Reinforcement Learning

Paper ID: 481, TITLE: Literature Survey on Part-of-Speech Tagging in Khasi: Using Synthetic Parallel Corpora and Linguistic Constraints

Authors: Sibalin War, Sarwan Singh and Rintu Das

Abstract: Khasi, a low-resource Austroasiatic language from Northeast India, is still very underdeveloped in natural language processing (NLP) because there aren't many annotated corpora, computational lexicons, or standardized POS taggers. This review examines hybrid rule-based and neural methodologies for part-of-speech tagging in Khasi and other low-resource languages. Traditional models like HMM and CRF get baseline accuracies of 76–89%, but deep learning methods like BiLSTM-CRF get up to 96.98% accuracy on Khasi data, and transformer models like RoBERTa get around 92%. Hybrid systems that mix neural models with language rules have also done well in many languages. To deal with a lack of data, some important strategies are synthetic corpus generation, data augmentation, and cross-lingual transfer learning. The review points out that morphology, handling out-of-vocabulary words, and keeping annotations consistent are still problems. It also says that effective POS tagging for Khasi depends on combining linguistic knowledge with advanced neural architectures and strong corpus development.

Keywords: POS tagging, Low resource languages, Neural Networks, Synthetic Corpora, Transfer learning, feature engineering

Paper ID: 484, TITLE: AI-Powered Automated Timeline Reconstruction in Digital Forensics

Authors: Abdullah Siddiqui, Dr. Syed Mufassir Yaseen, Mohd Javid and Asif Farooq

Abstract: Digital forensics requires an accurate reconstruction of event timelines from heterogeneous data sources such as system logs, emails, and file metadata. Manual timeline

reconstruction is time-consuming, error prone, and becomes intractable at an enterprise scale. This paper presents an AI-powered automated timeline reconstruction framework that integrates classical forensic tools (Autopsy, The Sleuth Kit) with machine learning (Long Short- Term Memory networks and Graph Neural Networks) and natural language processing for robust event extraction, correlation, and chronological ordering. We describe the system architecture, preprocessing pipeline, model designs, evaluation metrics, and a full scale implementation that demonstrates improved accuracy and significant analyst- effort reduction. Our hybrid LSTM-GNN model captures both local temporal dependencies and global relational patterns, addressing limitations of prior approaches that treat these aspects separately. Testing on public datasets (NIST CFReDS, DFRWS challenges) and realistic synthetic scenarios shows that our method gets 92.7% of the order right and 89.0% of the edge predictions right, and it also gives investigators clear visualizations. We conduct a more in-depth analysis of model robustness, talk about what makes a model admissible in court, and give a thorough comparison of our method to the best existing methods. The framework reduces analyst time by 64.3% while maintaining forensic validity and chain of custody preservation.

Keywords: Timeline Analysis, Autopsy, Event Correlation, GNN, NLP

Paper ID: 498, TITLE: Mitigating the Environmental Footprint of AI, Strategies for Eco-Friendly Large Language Models

Authors: Tarunjit Yumnam and Dr. Sumegh Tharewal

Abstract: Large Language Models (LLMs) have become a gem of 21st century in modern AI applications, however their environmental impact has raised concerns. This study aims to explore the dual nature of LLMs' environmental impact of LLMs and identify strategies to mitigate their environmental footprint while balancing innovation and sustainability. Through a systematic literature review, data collection, and analytical framework, this study assessed energy consumption, carbon emissions, and existing eco-friendly AI practices. The proposed strategies include energy-efficient architectures, renewable energy integration, model optimization techniques, and green AI practices. Data center management and infrastructure improvements, such as efficient cooling systems, heat recycling technologies, and location-based strategies, are also discussed. This study highlights the importance of collaborative research, open-source initiatives, and cross-

industry partnerships in promoting sustainable AI development. Life cycle assessment, continuous improvement, and transparent reporting are emphasized for achieving long-term sustainability. This study also examines the role of policies and regulations in establishing industry standards, incentives, and international cooperation. The study concludes by summarizing the key findings, discussing challenges and future directions, and providing recommendations for further research on eco-friendly AI development. The research aims to provide guidance for a cost-effective system without compromising model quality. The research aims to provide a guidance towards carbon-aware system design in the context of adapting language models. The research finds a way to finetune the LLM models such as BERT, DistilBERT, Hybrid BERT and T5-small with freely available GPUs and TPUs while the actual cost to buy the GPUs and TPUs is very high.

Keywords: Carbon emissions., LLM Finetuning., Environmental footprint., Green AI.

Paper ID: 516, TITLE: Domino Logic Schmitt Trigger with reduced leakage by stacking

Authors: Abhay Pratap Singh and Anurag Govind Rao

Abstract: This paper highlights leakage-reduced Schmitt trigger circuits with improved hysteresis width. Domino logic Schmitt Trigger with reduced leakage by stacking (DSTRS) is employed as a dual-purpose circuit owing to the addition of a control module, and can act as a domino logic as well as a Schmitt trigger (ST) circuit. Utilizing the Cadence Virtuoso tool and UMC 45nm CMOS technology, all simulation work has been completed. The proposed Domino logic Schmitt trigger with reduced leakage (DSTR) has less dynamic power dissipation, leakage power dissipation, and delay, respectively, as compared to conventional ST, which makes it a more efficient ST. Compared to the traditional circuit, the suggested DSTL has a wider hysteresis. The higher hysteresis width than that of other reported circuits makes it more practical for use in a noisy environment

Keywords: SchmittTrigger, Domino Logic Circuit, Hysteresis width, Noise Immunity, Cadence Virtuoso

Paper ID: 519, TITLE: Performance Improvement of Field oriented Controlled Permanent Magnet Synchronous Motor Based Electric Vehicle Drives by ANN Controller

Authors: Atul Kumar and Asha Rani

Abstract: The present work represents the design and testing of artificial neural network controllers for permanent magnet synchronous motor drives applied in electric vehicles along with the conventional controller. This control methodology intends to leverage the power of adaptive learning offered by artificial neural networks (ANN) to overcome the challenges of electric vehicle propulsion, such as varied operating conditions, time-varying parameters, and nonlinear dynamics of systems. Simulation studies indicated that ANN controllers outperformed conventional PI-based field-oriented control methods for all the aspects of speed regulation, ripple reduction in torque, and robustness against perturbation. Real-time modifications of the neural network model to changes in load and outside noise improve performance without the need for complicated decoupling or tedious tuning. These results demonstrate that the ANN technique for the control of PMSMs is quite suitable for electric vehicles and easily integrated into them. It can help in driving by improving efficiency, making runs smoother, and could adapt to various needs

Keywords: Electric Vehicle (EV), Artificial Neural Networks (ANN), Field-Orientated Control (FOC), Permanent Synchronous Motor (PMSM), Proportional-Integral controller (PI)

Paper ID: 520, TITLE: A Systematic Review on Shape Descriptors for Real Time Object Detection

Authors: Shalu Gupta and Jayanta Yumnam Singh

Abstract: This systematic review provides a comprehensive comparative analysis of classical and modern shape descriptors used in real-time object detection systems. Shape descriptors play a crucial role in capturing geometric information, enabling robust object recognition even under transformations such as rotation, scaling, and translation. The study categorizes descriptors into contour-based, region-based, and histogram-based types, evaluating them across multiple parameters including computational efficiency, accuracy, invariance properties, and real-time applicability. We further examine hybrid approaches

that integrate traditional shape descriptors with deep learning architectures for enhanced detection performance. By synthesizing results from over 30 peer-reviewed papers, this review identifies key trends, performance trade-offs, and future research directions in deploying shape-aware models for real-time applications.

Keywords: Shape Descriptors, Real-Time Object Detection, Contour-Based Descriptors, Region-Based Descriptors, Histogram of Oriented Gradients (HOG), Hu Moments, Zernike Moments, Chain Code, Legendre Moments

Paper ID: 522, TITLE: Arduino Uno Based NFC-Enabled Smart Labels for In-stant Text-to-Speech Access in Public Spaces

Authors: Rathlavath Chandru, V Shiva Prasad Nayak and Tahaseen Syed

Abstract: In the modern world, technology plays an essential role in improving accessibility for people with disabilities. This paper deals with a Text-to-Voice Converter System for the Visually Impaired using Near Field Communication (NFC) Technology based on Arduino Uno. This helps blind people to identify objects using audio output. This paper addresses the lack of accessible information that supports visually impaired individuals in various settings, including public spaces, hospitals, bus stations, government offices, and educational institutions. To fill this gap, we proposed an Arduino Uno-based Enabled Smart Label System that offers instant text-to-speech (TTS) access. An NFC label encoded with essential information about different products or objects for which we need to be tagged. Once the user taps an NFC card or tag on the NFC reader module PN532, NFC is used to detect NFC tags via the I2C interface. The reader is interfaced with a microcontroller, typically Arduino Uno, and the system identifies the previously stored text. The DF Player Mini, which is a mini-MP3 module, is used to play MP3 files stored on a microSD card, and a Micro (4/8GB) SD Card is used to store audio files (mp3), and it converts them into speech using a dedicated TTS module. A buzzer system and LED are used to enhance user feedback and confirm successful reading. This system operates at low power, supports multi-language audio output, and is mainly suitable for use in crowded or high-noise environments. The proposed method also provides low-cost, fast, and reliable assistive technology that promotes independence and accessibility for visually impaired individuals. The results in this paper demonstrate high response accuracy, and interaction with the user is simple and scalable for various public applications.

Keywords: Arduino Uno, DF Player Mini, Micro SD Card, PN532 NFC Reader, NFC Tags, Buzzer

Paper ID: 526, TITLE: Fake vs Real: Emotion-Driven Deep Learning Framework for Fake News Detection

Authors: Dimple Choudhury, Bhabesh Kalita and Dharitri Brahma

Abstract: The widespread diffusion of false information on social media and websites has prompted the detection of fake news as a crucial area of research. In this paper, a comparative study of two deep learning (DL) models, namely the Convolutional Neural Network (CNN) and Bidirectional Long Short-Term Memory (BiLSTM) network, is presented to classify real and false news using the ISOT dataset. Both models were compared with and without GloVe pre-trained word embeddings (glove-wiki-gigaword-100) to understand the effect of semantic word representation on classification performance. All experiments were carried out with 80:20:15 training, testing, and validation splits as well as with default parameters such as a learning rate of 0.001, a batch size of 64, and 30 epochs. Without the use of embeddings, the BiLSTM and CNN models scored 73% and 81.47% on the validation set, respectively. Once GloVe embeddings were added, the results were significantly improved, with the BiLSTM+GloVe achieving 99.11% accuracy and the CNN+GloVe achieving a maximum accuracy of 99.38%. Further tests with precision, recall, F1-score, and confusion matrix analysis confirmed that the CNN+GloVe setup had the best and most stable performance at distinguishing between fake and real news reports.

Keywords: News Classification, Fake news, Deep Learning, CNN, BiLSTM, GloVe

Paper ID: 530, TITLE: A Cybersecurity Oriented Wireless Forensic Architecture for Real Time 802.11 Attacks Monitoring and Evidence Collection using Atheros based Devices

Authors: Abhinav Mishra, Sandeep Pati Tripathi, Ajay Verma, Upendra Nath Tripathi and Alok Tripathi

Abstract: The use of wireless local area networks (WLANs) consisting of the IEEE 802.11 standards is still a vital part of the current digital infrastructure, but it is constantly under attacks by malware activities because of its unrestricted broadcasting. This paper is a proposal of wireless forensic architecture which is cybersecurity-oriented and should be implemented to have real-time monitoring, detection and collection of evidences of IEEE 802.11 security breach. The architecture uses the Atheros based wireless devices in authorized monitoring mode in controlled environments to capture and analyze wireless management and control frames. The suggested structure does not aim to support illegal access but instead concentrates on the legitimate observation, protocol-based examination, and the forensic preparedness. As experimental analysis shows, real-time attacks awareness, consistent evidence maintenance and analysis of post-incident are feasible, and they can be done without violation of ethical or legal research practices. The proposed system will assist the incident response teams, academic researchers, network administrators and Law Enforcement Agencies in enhancing the WLAN security posture and gathering of evidences.

Keywords: Wireless Forensics, IEEE 802.11, Cybersecurity Monitoring, Digital Evidence, Atheros Chipset.

Paper ID: 531, TITLE: Reduction of Leakage Power in High-Speed Full Adder Circuits Using 45 nm CMOS Technology

Authors: Praveen Kumar, Shailendra Mishra, Arjesh Jha and Anup Kumar

Abstract: In this work we are using modern VLSI and FPGA-based systems to work better when their arithmetic circuits are designed efficiently. As an essential part of digital processors and arithmetic logic units, the complete adder directly affects system performance, power efficiency, and resource usage. Two distinct design techniques are used in this study to compare 1-bit full adders: (i) implementation using NAND gates alone, and (ii) implementation using a mix of XOR, AND, and OR gates. To assess characteristics like average power consumption, propagation latency, and transistor count under advanced CMOS process nodes, Cadence Virtuoso is used to develop and simulate transistor-level schematics. For FPGA implementation, the same designs are generated on the Xilinx Vivado platform and modeled in HDL to guarantee hardware validation. The results of both simulation environments are used to show the tradeoffs in hardware complexity,

delay, and power consumption. The NAND only approach is faster, whereas the XOR, AND, and OR based structure have a lower power draw and a smaller transistor count. The information in this paper should be of some value to low-power VLSI and FPGA adder circuit optimization.

Keywords: Full Adder, Average Power, Propagation Delay, CMOS Technology



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