4th

INTERNATIONAL CONFERENCE ON COMPUTING AND RELATED TECHNOLOGIES (ICCRT-2025)

"Sustainable Computing and AI: Shaping the Future of Industry and Society"

21-22 May 2025

Abstract Book

Sindh Madressatul Islam University,
Karachi, Sindh, Pakistan

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About ICCRT-2025

The 4ᵗʰ International Conference on Computing and Related Technologies (ICCRT-2025), under the theme "Sustainable Computing and AI: Shaping the Future of Industry and Society," addresses the increasingly vital intersection between advanced computing and sustainable development. In a world experiencing rapid technological evolution and complex environmental challenges, the conference brings together thought leaders, researchers, and professionals to explore how computing may be harnessed responsibly to build a more equitable, innovative, and sustainable future.

ICCRT-2025 serves as a multidisciplinary platform for engaging in-depth discussions on emerging research, trends, and innovations in areas such as artificial intelligence, data science, cybersecurity, computer systems, smart technologies, human-computer interaction, IoT, and digital innovation. Through technical sessions and panel dialogues, participants explore real-world challenges, theoretical insights, and forward-thinking solutions across academic and industrial domains.

At its core, ICCRT-2025 fosters collaboration, inspires innovation, and promotes the ethical and responsible use of technology. It creates an inclusive environment for knowledge exchange, where practitioners, scholars, and students share their work, receive constructive feedback, and cultivate partnerships that shape the future of research and development. These proceedings reflect that mission—capturing the diversity, depth, and direction of discourse emerging from this academic gathering.

ICCRT-2025 welcomes a distinguished and diverse body of participants, including international scholars, industry experts, early-career researchers, and postgraduate students. Their shared knowledge, creativity, and commitment contribute to the vibrancy and relevance of the conference. Appreciation extends to the organizing committee, technical team, and reviewers whose collective effort upholds academic standards and ensures the integrity of the conference process.

Gratitude is also extended to sponsors and institutional partners, including Sindh Higher Education Commission (SHEC), whose continued support reinforces the impact of this initiative. Special recognition is offered to keynote speakers, panel moderators, and session chairs for enriching the conference with their thought leadership and global perspectives.

Particular thanks are owed to Prof. Dr. Mujeebuddin Sahrai , Vice Chancellor of Sindh Madressatul Islam University, whose vision, leadership, and encouragement provided the foundation for this event's success. His dedication to academic excellence continues to advance the university's position as a hub for innovation and forward-looking research.

The impact of ICCRT-2025 manifests through the ideas it cultivates, the collaborations it fosters, and the research directions it inspires. These proceedings stand as a vital resource for continued inquiry, reflection, and development in sustainable computing and AI.

Readers are encouraged to engage with the content presented here, apply insights to their fields of practice, and contribute to shaping a digital future that is both intelligent and sustainable.

A Message from Chairman
Sindh Higher Education Commission

It is indeed a pleasure that Sindh Madressatul Islam University is hosting 4th International Conference on Computing and Related Technologies-ICCRT-25- under the theme: "Sustainable Computing and AI: Shaping the Future of Industry and Society." This conference stands as a testament to our collective commitment of SMIU to exploring the transformative power of computing technologies in fostering a sustainable and equitable future.

As we delve into discussions on cutting-edge innovations, it is fitting to reflect upon the illustrious history of our host institution. Founded on September 1, 1885, by the visionary educationist Khan Bahadur Hassanally Effendi, Sindh Madressatul Islam was established as the first modern Muslim educational institution in Sindh. Among its distinguished alumni is none other than the Father of the Nation, Quaid-e-Azam Mohammad Ali Jinnah, who studied here from 1887 to 1892. His formative years at SMIU played a pivotal role in shaping his vision and leadership.

SMIU, being historically old institution, and young as a university elevated in 2012, has continued its legacy of academic excellence, now offering diverse programs across disciplines such as Computer Science, Business Administration, Media and Communication Studies, Environmental Sciences, English, Education and others. With a student body exceeding 6,000 with highly qualified faculty, the university remains at the forefront of educational innovation.

In the spirit of our institution's enduring commitment to progress, ICCRT-25 aims to serve as a dynamic platform for interdisciplinary collaboration. The conference will explore a range of sub-themes, including:

- Data Science and Artificial Intelligence
- Computer Networks, Cybersecurity, and Computer Systems
- Computer Vision, Image, and Signal Processing

- Information Systems, Human-Computer Interaction, and Enterprise Systems
- Smart Living, Digital Technologies, and the Internet of Things
- Social Media and Web Technologies

These discussions are crucial as we navigate the complexities of integrating sustainable practices within the rapidly evolving realms of computing and artificial intelligence. Universities are the nurseries of new knowledge and it is always a pleasure to be with the brain of the country in form of different events organized by the institutions. I congratulate and appreciate the organizing team and the Vice Chancellor Dr. Mujeeb Sahrai for putting in their efforts to organize this conference and gather all the stakeholders at one platform.

As we embark on this intellectual journey, let us draw inspiration from SMIU's rich heritage a legacy of enlightenment, resilience, and unwavering pursuit of knowledge. May this conference ignite innovative ideas, foster meaningful collaborations, and contribute to shaping a future where technology serves as a catalyst for sustainable development and societal well-being.

The university has been progressing immensely under the leadership of Prof. Dr. Mujeebuddin Sahrai. Along with academic development of the youth, he has focused on the research related activities which is an encouraging point. I am sure the university will further prosper and develop.

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Prof. Dr. S.M. Tariq Rafi
Chairman

A Message from Vice Chancellor of Sindh Madressatul Islam University

It gives me great pleasure to welcome you to the 4th International Conference on Computing and Related Technologies (ICCRT-2025), hosted by Sindh Madressatul Islam University (SMIU). This year's conference, themed "Sustainable Computing and AI: Shaping the Future of Industry and Society," brings together global scholars, researchers, and industry professionals to engage in thought-provoking discussions and share pioneering research in computing and its allied disciplines.

In today's rapidly evolving digital world, sustainable and intelligent technologies are at the heart of transformative change across industries and communities. ICCRT-2025 offers a timely and vital platform to explore developments in data science, artificial intelligence, cybersecurity, smart technologies, and other critical areas. With an interdisciplinary approach, the conference seeks to foster collaboration and contribute meaningful solutions to contemporary challenges.

As the Vice Chancellor of Sindh Madressatul Islam University, I take immense pride in the institution's historic legacy, established in 1885 by the visionary Khan Bahadur Hassanally Effendi. It has produced illustrious figures including Quaid-e-Azam Mohammad Ali Jinnah and continues to uphold a tradition of excellence and innovation in education and research.

I extend my sincere gratitude to all participants, speakers, and organizers for their contributions to ICCRT-2025. I am confident that this conference will spark impactful ideas and collaborations that shape a sustainable and intelligent future.

Prof. Dr. Mujeebuddin Sahrai
Patron-in-Chief, ICCRT-2025

A Message from the Convener

It gives me immense pleasure to present the proceedings of the 4th International Conference on Computing and Related Technologies (ICCRT-2025), hosted by Sindh Madressatul Islam University, Karachi. The theme of this year's conference, "Sustainable Computing and AI: Shaping the Future of Industry and Society," reflects our shared vision to foster academic and practical discourse on the role of emerging technologies in addressing today's global challenges.

ICCRT-2025 stands as a dynamic platform that brings together an outstanding community of researchers, academicians, industry professionals, and students from diverse backgrounds. This conference provides an opportunity not only to exchange ideas but also to create interdisciplinary collaborations that advance both theoretical understanding and applied solutions in computing. The growing relevance of sustainability in technological innovation calls for continued exploration, and this year's deliberations have highlighted how artificial intelligence, data-driven decision-making, and smart computing systems can positively impact industries and societies alike.

The conference proceedings encapsulate the intellectual contributions of all participating authors whose work was peer-reviewed and selected for inclusion. These proceedings represent a valuable body of knowledge—documenting new findings, innovative methodologies, and future-oriented discussions. I am confident that the insights shared here will serve as a lasting resource for researchers, policymakers, and practitioners aiming to address real-world challenges through sustainable and responsible computing.

I would like to extend my sincere gratitude to all paper presenters, contributors, and attendees for their enthusiastic participation and scholarly input. I am also deeply thankful to our keynote speakers and session chairs, whose expertise added depth and dimension to the discussions.

Special recognition is due to the organizing committee, reviewers, technical teams, and volunteers whose tireless efforts ensured the successful planning and execution of this academic event. I also thank the leadership of Sindh Madressatul Islam University for their continued support and guidance.

As Convener, I feel privileged to have witnessed the commitment and collaboration that brought ICCRT-2025 to life. I hope that these proceedings will inspire further research, dialogue, and innovation in the computing community and beyond.

Prof. Dr. Aftab A. Shaikh
Convener, ICCRT-2025
Dean Faculty of IT
Sindh Madressatul Islam University, Karachi

A Message from the Conference Chair

It is my privilege to welcome you to the 4th International conference of Computing and Related Technologies and to present this abstract book, thoughtfully curated around the critical and timely theme of "Sustainable Computing and AI: Shaping the Future of Industry and Society." As we convene to explore the intersection of technological innovation and environmental stewardship, we are reminded of the urgent need to harmonize progress with planetary boundaries-ensuring that the tools we build today safeguard the world of tomorrow.

This year's theme resonates with a global imperative: to advance computing and artificial intelligence in ways that prioritize sustainability, equity, and resilience. From energy-efficient algorithms and green data centers to AI-driven solutions for climate modeling, renewable energy optimization, and circular economies, the work showcased here embodies the dual promise of technology as both a catalyst for industrial transformation and a force for societal good.

I extend my heartfelt appreciation to the authors whose visionary research fills these pages, the reviewers whose rigor and insights elevated the quality of submissions, and the organizing committee whose tireless efforts have made this event possible. To all attendees-your presence, expertise, and passion are the lifeblood of this conference. As you engage in dialogue, share knowledge, and collaborate across disciplines, I urge you to reflect on the profound role we play as innovators and stewards. Let us draw inspiration from the urgency of climate action, the potential of AI for social equity, and the imperative to design systems that serve humanity without compromising the ecosystems we depend on.

The fusion of sustainable computing and AI is not merely a technical challenge it is a moral and creative endeavor. Together, we have the power to redefine industries, empower communities, and pioneer technologies that are not just smart, but also wise. May this conference spark collaboration that transcend sectors, ignite solutions that bridge ambition with accountability, and inspire a future where technology thrives in harmony with nature and society. With optimism and gratitude.

Prof. Dr. Abdul Hafeez Khan
Chairperson, Department of Software Engineering,
Conference Chair, ICCRT-2025

A Message from the Conference Secretary

On behalf of the organizing committee, it is my pleasure to welcome you to the 4th International Conference on Computing and Related Technologies (ICCRT-2025). This year's conference, is being organised under the theme "Sustainable Computing and AI: Shaping the Future of Industry and Society." It brings together experts, researchers, and practitioners from diverse fields to explore innovative solutions and advancements in computing and artificial intelligence.

The conference features a broad range of sub-themes, including Data Science and AI, Computer Networks and Cybersecurity, Computer Vision and Signal Processing, Information Systems, Human-Computer Interaction, Smart Living, Digital Technologies, IoT, and social media & Web Technologies. These areas are critical for addressing global challenges and fostering a sustainable and intelligent future for both industry and society.

As we move forward in this exciting journey, we believe the research presented in this abstract book reflects the passion, creativity, and vision of the global community of scientists, engineers, and thought leaders who are pushing the boundaries of what is possible. This publication is a testament to the significant contributions of the presenters, whose work will shape the discourse around sustainable computing and AI for years to come.

We sincerely thank all the authors, participants, and sponsors for their invaluable contributions. We are confident that the presentations and discussions at ICCRT-2025 will spark new ideas, collaborations, and innovations. We encourage all attendees to actively engage with one another, share insights, and explore the numerous opportunities for cross-disciplinary collaboration that this   conference presents.

Thank you for your participation in ICCRT-2025. We look forward to an inspiring and productive conference that will contribute to the development of sustainable and innovative solutions to the challenges facing our global society.

Dr. Mansoor Ahmed Khuhro
Chairperson, Department of Artificial Intelligence
and Mathematical Sciences,
Conference Secretary, ICCRT-2025

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4th International Conference on Computing and Related Technologies (ICCRT-2025)

Sustainable Computing and AI: Shaping the Future of Industry and Society

The 4th International Conference on Computing and Related Technologies (ICCRT-25) provides a premier platform for researchers, academicians, and industry professionals to engage in critical discourse on the transformative power of computing in today's world. With a central focus on sustainability and innovation, this year's theme *"Sustainable Computing and AI: Shaping the Future of Industry and Society"* emphasizes the role of emerging technologies in addressing global challenges and enabling future-ready solutions.

The conference will explore a wide array of topics, from artificial intelligence and data science to smart technologies and cybersecurity. ICCRT-25 aims to foster interdisciplinary collaboration and promote cutting-edge research that not only advances scientific understanding but also contributes to sustainable societal and industrial development.

Conference Sub-Themes:
- Data Science and Artificial Intelligence
- Computer Networks, Cybersecurity, and Systems
- Computer Vision, Image and Signal Processing
- Information Systems, Human-Computer Interaction, and Enterprise Systems
- Smart Living, Digital Technologies, and IoT
- Social Media and Web Technologies

ICCRT-25 welcomes innovative contributions that push the boundaries of computing while aligning with sustainable goals, offering a unique opportunity to shape the digital future responsibly and inclusively.

CONTENTS

A Comparative Study of Advanced Deep Computational Intelligence Models for Breast Cancer Detection

Anwar Ali Sathio[1] - Muhammad Malook Rind[2] - Shafique Ahmed Awan[1] - Muhammad Nasrullah[1]

1. Benazir Bhutto Shaheed University, Karachi, Pakistan
2. Sindh Madarssatul Islam University, Karachi, Pakistan

Abstract: Breast cancer remains one of the leading causes of morbidity and mortality among women globally. Timely and accurate diagnosis is critical to improving treatment outcomes and patient survival rates. This study presents a comparative analysis of advanced deep computational intelligence models for breast cancer detection, focusing on both classical machine learning techniques and emerging deep learning architectures. Specifically, Logistic Regression, Support Vector Machine (SVM), and Random Forest were benchmarked against deep learning approaches such as Autoencoder, GAN-style Multilayer Perceptron (MLP), and TabNet. Utilizing the well-established Wisconsin Diagnostic Breast Cancer (WDBC) dataset, which includes 569 samples with 30 numerical features derived from fine needle aspirate (FNA) images, rigorous preprocessing, feature engineering, and model optimization were conducted. Leveraging the WDBC dataset-which encapsulates imaging-derived morphometric features akin to those extracted from MRI or digital pathology systems, this study evaluates deep advanced computational models for accurate tumor classification. The evaluation metrics including accuracy, precision, recall, F1-score, and confusion matrices were used to assess models' performance. These models, Random Forest and GAN-style MLP achieved the highest accuracy of 96.49%, with corresponding F1-scores close to 97%, highlighting their robustness in tumor classification. While deep learning models offered superior adaptability to complex data structures, classical models like Random Forest demonstrated excellent interpretability and efficiency, making them suitable for resource-constrained clinical environments. TabNet, despite its novel architecture, underperformed likely due to dataset limitations. This study features the potential of deep computational intelligence approaches in breast cancer diagnostics and supports the integration of interpretable and scalable AI models in clinical decision support systems.

Keywords: Breast Cancer Detection, Deep Learning, svm, Random Forest, GAN -Style MLP, TabNet, Classification.

A Hybrid Cryptographic Framework Integrating Classical, Post-Quantum, and Quantum Key Distribution Using IBM Qiskit

Asad Raza[1] - Nouman Qadeer Soomro[2] - Raja Sohail Ahmed Larik[3] - Muhammad Ejaz[3] - Muhammad Nauman Irshad[3]

1. School of Computer Science and Engineering, Central South University, Changsha China
2. Department of Software Engineering, MUET SZAB Campus, Khairpur Mir's
3. Department of Computer Science, Ilma University, Karachi

Abstract: The emergence of quantum computing poses a serious threat to classical cryptographic systems, necessitating the development of quantum-resistant security frameworks. This research addresses this critical gap by proposing a hybrid encryption model that integrates classical algorithms, post quantum cryptography, and quantum key distribution (QKD) to ensure secure communication in the post-quantum era. The objective of the study is to enhance the entropy and resistance of cryptographic keys by combining multiple cryptographic layers. The proposed model generates a final hybrid key (Kfinal) composed of classical (Kclassical), post-quantum (Kpq), and quantum (Kqkd) components. To evaluate the effectiveness of the proposed model, we con ducted simulations using Python and IBM Qiskit. Entropy values were calculated to measure the unpredictability and strength of the generated keys. Experimental results show that the hybrid key achieves higher entropy compared to individual components, indicating superior randomness and robustness. Furthermore, performance comparisons across various methods-including AES, lattice-based encryption, and QKD—were analyzed in terms of encryption time and entropy. The proposed hybrid scheme demonstrated strong resistance against both classical and quantum attacks. This study also includes a quantum simulation of random bit generation using Qiskit, executed on both simulators and real IBM quantum hardware. The results validate the signifi cance of QKD in enhancing key security. Overall, the proposed model offers a scalable and future-proof solution for secure communication, contrib-uting to the advancement of quantum safe cryptographic systems.

Keywords: Quantum Cryptography, Post-Quantum En cryption, Quantum Key Distribution, Entropy Analysis, Qiskit, Hybrid Security Framework, Classical Cryptography.

Advancing Requirement Engineering Using of Large Language Models (LLMs)

Ushna Tasleem - Hira Sultan - Kanwal Zahoor

Computer Science and Software Engineering Department,
Jinnah University for Women

Abstract: Requirement engineering is the process of gathering and refining the requirement of the developing system. Requirement engineering is the important stage of any software development life cycle which include elicitation, Kanwal Zahoor Computer Science and Software Engineering Department Jinnah University for Women Karachi, Pakistan kanwal.zahoor@juw.edu.pk software development process. The outcome yields substantial gains for both developer and practitioner requirement specification, requirement evaluation and documentation but the complexities of this phase regulate the success and failure rate of the system. This is the era off generative AI where everything can easily be solved using AI generative tools in which Large language models plays a vital role in different domains like machine learning, artificial intelligence and natural language processing they are playing a vital role in the requirement engineering process. These LLMS are proficient of producing the content on the provided prompts, also demonstrate their potential as effective writing sub-ordinates. [1] [3] This paper discusses the role of LLMs in advanced requirements engineering and discovers the capabilities of numerous tools in this domain. We also demonstrate the efficiency of various LLM tools and present diverse results from different AI generative tools.

Keywords: Large Language Model (LLMs), Requirement Engineering (RE).

AI on the Road: Real-Time License Plate Recognition with K-NN

Moazzam Ali Bhutto[1] - Ajeet Kumar[1] - Anam Memon[2] - Muhammad Salman[1]

1. Department of Computer Science, NUML Hyderabad Campus
2. Department of Computer Systems Engineering, Mehran UET, Jamshoro

Abstract: Automatic license plate recognition (ALPR) and character recognition is technology of image processing and widely used area for research and development especially in intelligence system. In ALPR system license plate detection from the original image is the most important phase. It is very challenging because of the variety of plate layouts and the non-uniform outside lighting conditions during image acquisition. A verity of techniques is proposed in the literature but they are having accuracy problems. In this work, we develop a license plate detection method using a KNN (K-nearest neighbor) classifier with contour. The system finds all possible contour in the image and performs rough character searching at different scales and analyses the contour width, height, and area to take a rough idea whether the contour can be a character or not. The results of our approach show that this method is comparatively impervious to: 1) variations in lighting, 2) license plate shapes, 3) camera perspective, 4) shadow images and 5) background variations. The system is tested with on 150 real time images, captured in campus premises and images downloaded from internet under different illumination conditions and we got 96% results. The system performs license plate segmentation based on Thresholding and Connected Component Analysis (CCA). In processing of binary image CCA is useful approach that mark each pixel of binarized image into component on the basis of pixel connectivity. Each pixel has assigned a value depending on the assigned value. At last characters are recognized by OCR using its trained classifier for characters recognition.

Keywords: Image Processing; KNN, Contours; Detection; Segmentations, OCR.

AI-Driven Troponin I Detection and Myocardial Infarction Severity Classification: Bridging the Gap in Heart Attack Diagnosis

Zahid Latif[1] - Noor Ahmed[2] - Naseer Ahmed[3]

1. Department of Computer Science & Information Technology, BUETK, Balochistan
2. Department of Computer Systems Engineering & Sciences, BUETK, Balochistan
3. Department of Computer Science, Sindh Madressatul Islam University, Karachi

Abstract: Accurate and timely diagnosis of myocardial infarction (MI) is important for effective clinical intervention, yet current diagnostic systems primarily focus only on detecting the presence or absence of heart attacks based on Troponin I levels enzymes. These traditional biochemical analyses, while effective to a certain extent, are often costly, time consuming, and do not provide insights into the severity or stages of the cardiac event major, medium, or minor. In this research, we pinpointed a significant flaw in current systems the inability to categorize the severity of heart attacks beyond binary detection. To rectify this, we developed an artificial intelligence-based diagnostic system with the ability to analyze microscopic images of blood samples in order to not only detect Troponin I levels but also classify myocardial infarction into 10 different classes, from miner to major heart attacks. This multi-class classification offers a more detailed and subtle insight into cardiac health, allowing doctors to evaluate the severity of myocardial damage better.

We used an optimized version of the ResNet deep learning architecture, chosen for its robust image classification capabilities. The model was trained and validated on a curated dataset, achieving an overall accuracy of 90% in identifying and classifying the level of heart attacks. The novelty of this research is its non-invasive, image based diagnostic method and the capability to yield a granular classification of cardiac levels something conventional methods cannot. This system presents a quick, cost-effective, and scalable solution, especially valuable in resource poor settings. In the future, we aim to expand the dataset using more varied clinical samples, with the addition of new biomarkers, and examine real-time deployment through integration with point-of-care diagnostic devices. This development has the potential to significantly improve early detection, risk stratification, and personalized treatment planning for patients with heart disease.

Keywords: Artificial Intelligence, Troponin I, Myocardial Infarction, Deep Learning for Medical Imaging, Medical Image Classification.

AI-Powered IoT-Based Soil Testing System for Fertilizer Optimization in Balochistan's Agricultural Landscape

Mohaib Afnan - Maheen Lehri - Madiyan - Sultan Ahmed

Department of Computer Science,
Balochistan University of Engineering and Technology (BUET) Khuzdar

Abstract: Agriculture in Balochistan faces persistent challenges due to inefficient fertilizer use, poor soil health monitoring, and limited access to modern technologies. This study presents an IoT-based soil testing system integrated with machine learning, specifically using the Gradient Boosting Regressor model, to predict the optimal use of NPK fertilizers. The system employs real-time sensors connected to a Raspberry Pi and a Wi-Fi module to collect and analyze key soil parameters such as nitrogen, phosphorus, potassium, pH, and moisture. Based on these readings, the trained AI model generates fertilizer recommendations aimed at enhancing soil fertility and increasing crop productivity. The approach minimizes overuse of resources, reduces environmental impact, and promotes precision agriculture in remote regions. The model is trained on localized soil data, making it adaptive to Balochistan's unique agricultural conditions. This innovation is a step toward sustainable farming practices and digital transformation in underserved rural landscapes.

Keywords: Machine learning, IoT, soil health, precision agriculture, Balochistan.

A Novel Deep Learning Approach to Detect Hello Flooding Attack in RPL Based IoT Systems

Sawera Tazeen[1] - Ghufran Ahmed[1] - Shahbaz Siddiqui[1] - Shahid Hussain[2]

1. Computer Science Foundation for Advancement of Science and Technology (FAST) National University of Computer and Emerging Sciences (NUCES) Karachi Campus

2. Computer Science and Software Engineering, Pennsylvania State University Burke Centre, United States of America

Abstract: The globalization facilitated by the internet has evolved significantly with the emergence of the Internet of Things (IoT) over the past decade. As the multitude of IoT devices continues to grow exponentially, so does the associated risk of security threats. Incidents of attacks on IoT devices have become as prevalent as those targeting conventional internet devices. The widespread applications of IoT in various sectors, including agriculture, farming, transportation, smart cities, and healthcare, highlight its transformative impact. Particularly in medical applications, the compromise of nodes can lead to severe consequences. Therefore, ensuring the security of IoT systems and networks is imperative. Within IoT networks, the Routing Protocol for Low-Power and Lossy Networks (RPL) stands out as a widely adopted network layer routing protocol. However, due to its inherent vulnerabilities, it becomes a prime target for IoT device attacks. Consequently, protective mechanisms are essential to safeguard RPL networks from potential threats. This paper introduces a novel approach designed to detect network layer hello flooding attacks within RPL networks. Furthermore, this paper lays the groundwork for future research in developing an efficient deep learning approach for detection of hello flood, version number and worst parent attacks with unsupervised data.

Keywords: IoT, RPL, hello flooding

AI Chatbot to Enhance Patient Engagement and Satisfaction through User Interaction

Muhammad Khalid Shaikh[1] - Mudasar Ahmed Soomro[2] - Saad Ali Asif[1] - Muhammad Fahim[1]

1. Faculty of Computing , Muhammad Ali Jinnah University Karachi
2. Department of Information Technology, Quaid-e-Awam University of Engineering, Science & Technology, Nawabshah

Abstract: Chatbots based on AI offer revolutionary solutions in healthcare through increased patient interaction, satisfaction, and access to health-related information. This study focuses on the development of an AI chatbot toincrease patient interaction and aid healthcare services. The chatbot, based on NLP and machine learning, interprets questions in real time, provides accurate advice, and facilitates communication between patients and healthcare professionals. A Kaggle dataset with diverse patient interactions was used for training purposes. Data cleaning, segmentation, and spelling were done using preprocessing techniques that kept the data of high quality. An HCI-based interface was adopted with emphasis on usability, accessibility, and control of errors for a good user experience. The chatbot scored 92.5% accuracy, 89.3% precision, and 91.7% recall in its performance for querying understanding, exhibiting excellent querying understanding performance. 87% user interaction and 84% task success rates during usability testing attested to its efficiency in patient care. In the future, contextual interpretation, multilingualism, and real-time health recommendations will be emphasized.

Keywords: Medical chatbot, Patient Engagement using HCI, HCI in Medical Chatbot, Patient chatbot support, 24/7 patient care support.

Brahui Handwritten and Printed Digit Recognition Using Deep Learning Approach A Step Toward Low-Resource Language Digitization

Hamid Saleh[1] - Ehsan Ullah[1] - Naseer Ahmed[2]

1. Department of Computer Science & Information Technology BUETK, Balochistan
2. Department of Computer Science, Sindh Madressatul Islam University, Karachi

Abstract: This paper introduces a novel approach to Brahui numerical digit recognition, addressing a critical technological requirement in low-resource language processing. Brahui, a Dravidian language spoken predominantly in Pakistan, lacks computational resources for digit recognition particularly for handwritten input. To address this gap, we developed a novel dataset with printed and handwritten Brahui digits, the first systematic effort toward digit recognition in the language. We implemented a Bidirectional Long Short-Term Memory (BiLSTM) neural network to recognize the digits with a recognition rate of up to 90%. The proposed system demonstrates consistent performance across different handwriting styles and digit forms. This work not only introduces a novel dataset but also establishes a strong baseline for future work in the Brahui Optical Character Recognition (OCR). Our findings have the potential to enable broader applications in document digitization, educational use, and digital inclusion for the Brahui community.

Keywords: Brahui digit recognition, low-resource language, handwritten digits, BiLSTM, optical character recognition (OCR), deep learning, dataset generation.

Comparative Analysis of Wired Communication Methods for Smart Grid Applications: Performance, Scalability, Reliability and Cost

Abdul Rafay[1] - Abbas Javed[1] - Uzair Khan[1] - Oman Khalid Butt[1] - Moazzam Shehzad[1] -Haad Ahmad[2]

1. Dept. of Electrical Engineering (RCET) University of Engg. & Tech. Lahore
2. Dept. of Electrical Engineering (KSK) University of Engg. & Tech. Lahore

Abstract: Smart grid development requires powerful communication infrastructure to efficiently manage complicated power systems. The research gap relayed to previous work is limited to small scale network and generalize approach, focus on wireless power transfer only. Wired Communication methods, such as Fiber optics, Power Line Communication (PLC) and hundreds of hybrids wired and wireless networks are important for reliable data transfer in these systems. This paper provides an extensive comparison between multiple wired communication methods, highlighting costs, performance, scalability, and reliability. By reviewing case studies and literature, we hope to provide insights into the relative applicability of each method in assessing them, to facilitate better-informed decisions among stakeholders in the deployment of communication infrastructure. The results indicate that Fiber Optics offer superior performance but at a high cost, Ethernet ensures reliability and stability for substations, DSL provides cost-effective solution for AMI and NANs despite higher latency, and PLC efficiently utilizes power infrastructure for AMI, demand response and substation monitoring.

Keywords: Power line communication (PLC), Digital Subscriber Line (DSL), Advanced Metering Infrastructure (AMI)

Computer Vision Based Real Time Exam Monitoring System

Abrar Gul - Shakeel Hamid

Department of Computer Systems Engineering
Balochistan University of Engineering & Technology, Khuzdar

Abstract: Ensuring the integrity of examination processes in educational institutions is essential for maintaining academic standards and fairness. Traditional methods of exam monitoring often struggle to prevent cheating and address the diverse needs of modern, remote, and online education environments. This thesis introduces an "computer vision based real time exam monitoring system", designed to tackle these challenges through advanced artificial intelligence technologies. The system enhances exam security and fairness by incorporating real-time surveillance, biometric authentication, and sophisticated algorithms for detecting cheating. It takes a comprehensive approach, addressing both technical and non-technical aspects of exam monitoring. The system's architecture prioritizes usability, efficiency, compatibility, dependability, and security, making it a holistic solution for online examinations. The development of the system focused on creating an intuitive and user- friendly interface for both students and faculty, coupled with robust data management and real-time analysis capabilities. Extensive testing and debugging were carried out to ensure the system's reliability and stability. This innovative exam monitoring system aims to foster a secure and transparent examination environment, emphasizing continuous improvement and scalability. By integrating cutting-edge technologies with thoughtful design and implementation, the system enables educational institutions to conduct exams with enhanced integrity and efficiency, ultimately improving the overall quality of education.

Corn Plant Diseases Detection Using Convolutional Neural Networks (CNNs)

Engr. Faria Naz

National University of Modern Languages (NUML) Hyderabad Campus

Abstract: The detection of plant diseases is essential for ensuring sustainable crop production and preventing yield losses. In recent years, gadgets gaining knowledge of strategies have shown amazing promise for automatic and accurate disorder detection. These studies give a technique for corn plant disease detection using Convolutional Neural Networks (CNNs). The proposed method harnesses the strength of deep mastering to routinely learn discriminative functions from corn plant snapshots, enabling accurate sickness categories. A complete dataset of categorized corn plant photos, protecting diverse diseases and wholesome conditions, is used for schooling the CNN version. Sizeable experiments reveal the effectiveness of the CNN-primarily based technique, accomplishing high accuracy costs in identifying corn plant illnesses. The proposed technique holds extensive capability for supporting farmers. Within the early detection and analysis of corn plant diseases, aiding in powerful disease control and advanced crop yield.

Keywords: Corn Plant Disease, Diagnosis, CNN, healthy and unhealthy.

Development of a Voice-Based Virtual Assistant for Personalized Information

Afrasiyab[1] - Naseer Ahmed[2]

1. Department of Software Engineering, Balochistan University of Engineering & Technology Khuzdar
2. Department of Computer Science, Balochistan University of Engineering & Technology Khuzdar

Abstract: In the rapidly advancing field of artificial intelligence, voice-based virtual assistants have revolutionized human-computer interaction. This study aims to develop a cost-effective virtual assistant using the power of ESP32 development board, integrating speech-to-text, natural language processing, and text-to-speech technologies to provide personalized information. This research aims to bridge the accessibility gap for underrepresented languages of Pakistan, the system supports advanced speech recognition and response generation capabilities of the Urdu & Brahui languages. Unlike conventional solutions like Siri and Alexa, this assistant prioritizes affordability and adaptability, making AI-driven services more accessible for socio-economic development, that offers voice-controlled functionalities, hardware integration, and multilingual support, specifically focusing on the Local languages of Pakistan (Urdu & Brahui) that reduce linguistic and cultural barriers. Comprehensive evaluations highlight its high accuracy that reached almost 97.80% and its response time is also impressive, practically 3.1 seconds, even in challenging environmental and noise conditions. The findings underscore the transformative potential of affordable AI tools in democratizing access to advanced technologies globally. By democratizing AI technologies, this study underscores the socio-economic impact of AI, its role in public sector transformation, and its potential to promote linguistic and digital inclusion as a fundamental human right.

Keywords: Multilingual AI, Natural Language Processing (NLP), Low-Cost AI Solutions, Speech-to-Text (STT), Text-to-Speech (TTS).

EEG Headset V2.0 Based Controlled Wheelchair

Rustum Ameer[1] - Naseer Ahmed[2]

1. Department of Software Engineering, Balochistan University of Engineering & Technology Khuzdar
2. Department of Computer Science, Balochistan University of Engineering & Technology Khuzdar

Abstract: Mobility impairments pose significant challenges to individuals with disabilities, particularly in achieving autonomy and improving quality of life. This project presents the development of a brainwave-controlled wheelchair using the Micro-tellect Brain Link Lite EEG Headset V2.0 and Arduino technology. The system interprets brainwave signals to enable intuitive, hands-free navigation for individuals with limited mobility. Leveraging advancements in Brain-Computer Interface (BCI) technology, the wheelchair integrates features such as motorized control, LED- based feedback, and user-friendly interfaces, ensuring enhanced usability and safety. The proposed solution is designed to be cost-effective, addressing the financial and accessibility barriers often associated with assistive technologies. Preliminary results demonstrate the feasibility of using EEG signals for reliable wheelchair navigation, highlighting its potential to significantly impact individuals with mobility challenges, particularly in underserved regions like Balochistan, Pakistan. Future improvements aim to integrate hybrid control systems, obstacle avoidance, and real-time feedback to further enhance user experience and system efficiency.

Enhanced Real-Time Face Detection in Challenging Environments: Leveraging YOLOv8 for Partially Occluded and Low-Light Conditions

Amina Shaikh[1] - Imran Khan Keerio[2]

1. International Islamic University, Malaysia
2. Sindh Madressatul Islam University, Karachi

Abstract: Face recognition technology is essential in modern surveillance systems; nevertheless, identifying faces in hard situations such as partial occlusion and low-light surroundings remains a significant problem. This study looks into the use of YOLOv8, an advanced deep learning model, to overcome these concerns. The model was evaluated using a tailored collection of photos depicting faces with varied degrees of occlusion (including masks, helmets, and scarves) and lighting conditions. The dataset was separated into three categories: 80% for training, 10% for testing, and 10% for validation. The training process was taken 150 times, with critical measures such as 93% precision, 88.7% recall, an F1-score of 0.90, and a mean average precision (mAP@50) of 0.92. The model performed well in ordinary surveillance circum-stances, but its detection efficacy decreased in cases of severe occlusions and low-light surroundings, as seen by a lower mAP@50-95 score of 0.512. Given these challenges, YOLOv8 provides a compelling solution for real-time face identification in security applications. Future research will focus on increasing the model's resilience through sophisticated pre-processing approaches, multi-modal detection, and transfer learning to improve performance in increasingly complicated real-world circumstances.

Keywords: YOLOv8, face detection, partially occluded faces, low-light conditions, deep learning, surveillance, real-time object detection, security systems.

Enhanced Mouth Cancer Detection Using Neural Networks: A Deep Learning Approach

Dilbar Hussain[1] - Syed Muhammad Daniyal[1] - Faiza Latif Abbasi[1] - Habiba Ibrahim[2] - Mohsin Mubeen Abbasi[1] - Usama Amjad[1]

1. Faculty of Engineering Science and Technology, Iqra University, Karachi
2. Dow International University of Health Sciences, Karachi

Abstract: Mouth cancer's high incidence and corresponding death rates make it an ongoing public health problem, especially for oral squamous cell carcinoma (OSCC) through the use of Machine Learning (ML) and Neural Networks (NN). The most prevalent kind of oral cancer, OSCC, develops from the squamous cells lining the oral cavity's mucosal surfaces. Tissues include the lining of the mouth, throat, and lips contain these thin, flat cells. Although OSCC can appear anywhere in the mouth, it most frequently occurs on the inside of the cheeks, the floor of the mouth, and the tongue. This research offers a hybrid approach to identifying and classifying mouth cancer. To improve the quality of input images, we emphasize a thorough approach that includes image preprocessing operations including scaling, grayscale conversion, and histogram equalization. Our framework uses ML to segment and classify malignant versus non-malignant tissues effectively. This approach overcomes the challenges associated with conventional diagnostic techniques that rely on texture segmentation and artificial neural networks. Using a variety of medical images of datasets, the suggested model demonstrates how ML may enhance diagnostic precision and promote early detection. Furthermore, as demonstrated by our systematic review, ML has been successfully applied in several areas related to diagnosing and treating oral cancer, highlighting the possibility of improved clinical decision-making. According to our research, the application of a cutting-edge ML hybrid approach is beneficial for the treatment of mouth cancer in general as well as for the early detection of lesions that may be malignant. To improve patient outcomes and quality of life, our research supports ongoing efforts to include accurate, non-invasive, and cost-effective diagnostic approaches in clinical practice. The proposed model has an accuracy of 96.68%, precision of 97.00%, recall of 96.68%, and an F1-score of 96.84%, demonstrating remarkable performance characteristics.

Keywords: Mouth cancer, Oral Cancer Detection, Machine Learning

Fashion Accessory Recommendation System

Sundus Latif[1] - Abdul Karim Kashif Baig[2] - Adnan Ahmed[3] - Muhammad Owais Rao[3]

1. Mohammad Ali Jinnah University, Karachi
2. Iqra university Main Campus, Karachi
3. Dept. of Computer Science, Bahria University, Karachi Campus

Abstract: This research focuses on the development of an AI-powered system that help people choose accessories that match their outfit and enhance outfit coordination by analyzing the dominant color in the fabric image. The system uses advanced color extraction to analyze the main shades in fabric and generates accessory suggestions that complement with the analyzed colors. It also integrates current fashion trend insights, such as geometric patterns and earthly tones, to make stylish and trendy recommendations suitable for fashion designers, stylists, and consumers. This AI-driven approach blends fashion and technology, helping users create well-coordinated outfits that align with modern styling trends. Issues like complexities in text-to-image development process and accessibility of data are encountered. In coming time improvements includes making bigger dataset to get more colors patterns and textures, good-tuning models for fashion targeting tasks, developing automated testing frameworks for accessory matching. The model holds energy for development into e-commerce platforms, individual styling applications and fashion suggestion systems, giving personalized and dynamic fashion solutions.

Keywords: Accessory Recommendation, Color Extraction, Fabric Analysis, Fashion AI, Outfit Coordination, Machine Learning, Styling Solutions, Image Processing.

Feature Analysis for Performance Optimization of Next Generation Wireless Communication Networks based on Free Space Optical (FSO) System

Waqas Ahmed Imtiaz - Muhammad Umar Khan - Azka Karim

Department of Electrical Engineering, Jalozai Campus,
University of Engineering and Technology, Peshawar

Abstract: The rapid growth in communication devices has driven the evolution of network architectures from distributed radio access networks (D-RAN) to centralized radio access networks (C-RAN). C RAN, which separates baseband units (BBUs) from remote radio heads (RHs) through functional splits, offers high-capacity connectivity. However, the deployment of C-RAN requires robust communication technologies capable of high-capacity, low-latency transmission between BBUs and RHs. Free space optical (FSO) technology has emerged as a promising solution in comparison with traditional counterparts like fiber-based passive optical networks (PONs), mmWave, and microwave technology. Despite its potential, FSO performance is hindered by environmental factors and atmospheric turbulence, leading to signal attenuation, increased bit error rates (BER), and reduced quality factor (QF). This work employs machine learning (ML) algorithms to identify the most influential parameter affecting QF in the 5G compliant FSO communication systems. Using principal component analysis (PCA) and random forest regression, it has been observed that the received power is the dominant feature impacting signal quality in FSO communications. The identification of received power as the dominant feature has significant implications for the design and optimization of the FSO systems not next generation communication networks.

Keywords: 6G, Radio Access Networks, Free Space Optical Communication, Machine Learning, Quality Factor, Passive Optical Networks.

Human Gender Classification Through Voice Recognition

Ali Muhammad

Department of Artificial intelligence & Mathematical Sciences,
Sindh Madressatul Islam University

Abstract: Speech recognition is a distinguish field of computation and artificial Intelligence is very progressive field of computer science, which makes easy life of human, become dynamically innovations, and enhanced the area of computer technologies. In this area the speech recognition is huge and sensitive virtually complex. It is able to classifying of human gender through voice recognition which is ambiguous of research, the strategies of this are to capture real time voice of human gender and extract the features by different methods. Although the fundamental frequency is, the major septum and fundamental frequency $\llbracket f \rrbracket\_0$ may contribute to the human discrimination of male and female voice categories. Frequencies have defined as the time interval between sequential voiced. Hence, a threshold frequency approximation calculated should use in a system for phase male gender classification. Fundamental frequency (f_o) estimations have referred to as frequency detection the main sensitivity for using the frequency period comes from the fact that the average fundamental frequency for male is typically in the range of 50-500 Hz, whereas for female it is 501-1000Hz. In the noise environment and classify the gender some time frequency mismatched and system confused and show the result of existing frequency gender but it will be result out the classified result in noise environment is 75% and misclassified result is male female. All these frequency elaborations have different phases of gender and situations as noise place and noiseless place elders here is notice that the frequency of female is high as compare to other speakers and second male frequency is high than elder female frequency contended and low frequency contend of male.The Fast Fourier Transforms (FFT) plays the major aspect that convert the time domain to frequency domain. This analog toward digital transforming to decipher the signal, and filter the noise and classify the gender either male or female. Naïve Bayes classifier contribute for classification the independence assumption training where train the system with the help of male and female voice and classify after these strategies the classification accuracy rate is 81%.

Keywords: Human Gender, Frequency, Fast Fourier Transform, Naïve Bayes.

Investigating Velocity-Dependent Heat Generation in Automotive Brake Discs Using Computational Fluid Dynamics

Mohammad Tariq[1] - Summaiya Hakeem[1] - Ehsan Ullah[2] - Naseer Ahmed[3]

1. Department of Computer Science & Information Technology BUETK, Khuzdar
2. Department of Software Engineering BUETK, Khuzdar
3. Department of Computer Science, Sindh Madressatul Islam University, Karachi

Abstract: Efficient thermal management in automotive braking systems is crucial for ensuring consistent performance, safety, and component longevity. This study investigates the velocity-dependent heat generation in automotive brake discs using Computational Fluid Dynamics (CFD). A three-dimensional model of a ventilated gray cast iron brake disc is developed, and thermal simulations are conducted under various vehicle velocities to analyze the heat generation and dissipation patterns. The results reveal a strong correlation between vehicle velocity and peak disc temperature, with higher velocities leading to significantly increased thermal loads. Detailed temperature distributions, heat flux profiles, and airflow patterns are analyzed to assess the impact of convective cooling and disc geometry on thermal behavior. The study highlights the dominant role of convection in heat dissipation and identifies critical hotspots under different braking conditions. These findings provide valuable insights for optimizing brake disc designs and developing advanced cooling strategies, contributing to safer and more efficient braking systems in modern vehicles.

Keywords: Thermal management, Brake disc heat generation, Computational Fluid Dynamics (CFD), Convective cooling, Braking performance.

Internet of Things Based Smart Education Teaching and Learning Model

Engr. Ali Ahmed[1] - Huma Ali Ahmed[2]

1. Department of Computer Engineering, Bahria University, Karachi Campus
2. Department of Computer Science, Newports Institute of Communications & Economics, Karachi

Abstract: A vast network of Internet of things (IoT) like objects, users, devices and smart properties collect and share data with each other. IoT helps humans to upgrade their lifestyles in all strands: Smart Healthcare, Smart Cities, Security and Safety, and Education. IoT plays a vital role in education sector to upgrade and modernize education models. IoT has yielded a platform by which information exchange between environment and people becomes possible with convenience. This paper explains the influence of IoT on education by modifying and enhancing the education models. It discusses the impact of IoT on Learning Modes, Applications and Stakeholders and also categorizes applications into class management, campus management, disability understanding and improving student learning process. This paper focuses on how IoT provides aid in creating an intelligent learning model.

Keywords: Internet of things, Smart learning, Applications, Learning methods, Students, Gadgets.

Investigating the Impact of AI-Driven Chatbots on the Acquisition of English as a Foreign Language

Aliza Dahri

Department of English, Shaheed Benazir Bhutto University
Sanghar Campus, Sindh

Abstract: The main objective of this research is to explore how AI- driven technologies particularly chatbots affect the learning of English as a foreign language among the undergraduate students. This study investigates the perceived advantages, academic achievements, difficulties, and overall satisfaction related to using chatbots for learning English. The research evaluated the impact of chatbots in language acquisition by measuring students' language skills before and after the introduction of these technological aids. Additionally, the study examines the challenges and limitations of using chatbots on language learning. It aims to pinpoint the obstacles faced in chatbots-based learning systems to gain insights for improvement. The results of this research will help in designing and implementing more effective language learning systems. Furthermore, the findings contribute significantly to the current academic literature on innovative methods for foreign language acquisition in higher education settings. The results obtained from this study offe significant insights to educators specializing in language instructions, developers responsible for designing curriculum, and technology expert interested in the effectiveness and limitations pf artificial intelligence technologies and chatbots in enhancing the English language learning process. However, the research provides empirically supported recommendations for integrating chatbots into language learning instructional methods and optimizing the effectiveness and involvement of FLA encounters the undergraduate students.

Keywords: AI-driven technologies, chatbots, English as a foreign language (EFL)Undergraduate, higher education.

Leveraging Generative AI for Financial Market Prediction

Muhammad Asfar - Muddasir Hasan Khan

Department of Data Sciences, FAST NUCES, Pakistan

Abstract: Financial Markets refers to any marketplace where financial instruments e.g. stocks, foreign exchange, crypto currencies etc. are bought and sold. Prediction of future prices is a key consideration in the trading and investments of these instruments. It is for this reason that there has been an exploration of various techniques to improve accuracy of predictions in financial markets, and stock markets in particular. Machine learning and Deep Learning have become popular methods for price prediction and recent advancements include integrating neural networks and ensemble learning with traditional approaches, such as time series analysis and regression models. This research shows a comparative analysis of stock market prediction by using different ML & Deep Learning models, with an aim to further integrate Explainable AI (xAI) and Generative AI techniques to forecast stock prices along with interpretability and AI-driven recommendations. The idea is to unleash the black box nature of traditional ML & DL models by generating a human-understandable explanation that incorporates explainability for changes in stock trends. Yahoo finance has been used to pull the data of the KSE-100 index from the Pakistan Stock Exchange data (PSX) for the past 15 years. 17 additional features were engineered that were used to predict the stock market trends. Different ML models XGBoost and Random Forest, along with Deep Learning Models like BiLSTM & GRU and Transformers, have been used to predict stock trends. To the best of our knowledge, this approach was not implemented earlier for the analysis of such datasets. Based on the results of this exercise, it is observed that GRU performed better than the traditional models with an R2 score of 0.9921, followed by Bi-LSTM and other ML models. It was also observed that GRU has the best MAE of 597.593, surpassing all other models.

Keywords: Financial Market Prediction, Explainable AI, Ensemble Methods, Machine Learning, Deep Learning, Large Language Models.

Machine Learning Methods for Water Efficiency: Artificial Intelligence Based Irrigation Management of Balochistan's Dams

Noorullah[1] - Naseer Ahmed[2] - Abdullah Shah[1] - Shakeel Ahmed[1]

1. Civil Department, Balochistan University of Engineering & Technology, Khuzdar
2. Department of Computer Science, Sindh Madressatul Islam University, Karachi

Abstract: Water scarcity is a serious issue in Balochistan, Pakistan, where effective irrigation systems are essential for sustainable agriculture. This research investigates the incorporation of Artificial Intelligence (AI) to maximize water release from dams to improve irrigation management and water resource sustainability. An Artificial Neural Network (ANN), Random Forest Regression, and Reinforcement Learning (RL)-based machine learning platform is constructed to forecast water demand from real time information. Ranging from patterns of rainfall to soil moisture levels, crop watering requirements, and reservoir capacities. Case studies in the chosen dams show a 30% enhancement in water consumption efficiency, a 25% decline in wastage, and a 15% rise in crop yield compared to the conventional method. By facilitating dynamic, data-informed decision-making, AI supports sustainable agriculture while solving water conservation problems for arid environments. The study addresses the SDG 6 (Clean Water and Sanitation)and SDG 2 (Zero Hunger) and provides insights for policymakers and stakeholders interested in effective, AI-facilitated water management practices for water-scarce conditions.

Keywords: Artificial Intelligence (AI), Machine Learning, Water Efficiency, Smart Irrigation, Water Resource Management, Balochistan, Dams, Reinforcement Learning, Predictive Modeling, Sustainable.

Machine Learning-Based Smart Students' Complaint Resolution System

Rimsha Javed[1] - Shaukat Wasi[1] - Muhammad Hussain Mughal[2]

1. Department Computer Science, Mohammad Ali Jinnah University, Karachi
2. Sukkur IBA University, Sukkur

Abstract: Student complaints play an essential role in any institution. Educational institutions need to manage student complaints effectively. Complaints must be routed to the appropriate department for student satisfaction and urgent resolution. However, the manual procedure for resolving complaints can take a while and may lead to delays, creating frustration for students and staff. Implementing an automated solution to speed up response times and reduce staff workload can benefit all stakeholders. To solve this problem, this research proposes an academic facilitation system that automatically classifies the departments and aspects of student complaints. While many researchers have proposed similar systems using supervised and unsupervised learning, our research focuses explicitly on complaints about the academic environment and its aspects. As student complaints were unavailable previously, we collected them through a survey form and manually annotated them with four departments and forty-two aspects. This labeled data was used to train our models, classifying complaints and identifying their aspects based on their descriptions. We used different algorithms, like Bidirectional Encoder Representations from Transformers (BERT), Convolutional Neural Networks (CNN), Support Vector Machine (SVM), Random Forest (RF), Decision Tree (DT), and OneVsAll, to classify the departments and identify the aspects of the complaints. Their performances are evaluated using various performance metrics. Out of the different models developed, OneVsAll, which had 94% accuracy for department classification and aspect identification, and Random Forest, which had 65% accuracy, performed well on all data samples. We had set some limitations, such as using a dataset of medium-sized texts that do not explicitly address finding hidden meanings in complaints. In the future, we plan to cover aspects like increasing the dataset size, handling large-sized complaint texts, and exploring techniques to uncover implicit meanings.

Keywords: Student Complaints, Academic Facilitation System, Machine Learning, Natural Language Processing, OneVsALL Approach, Random Forest, Department Classification, and Aspect Identification.

ML-Based Speed Violation Detection and E-Challan Generation using YOLOv8 and DeepSORT

Javed Hussain - Muhammad Arbab Iqbal - Prof. Ameen Khowaja

Department of Computer Science, Sindh Madressatul Islam University, Karachi

Abstract: Conventional traffic enforcement mechanisms, on the whole, tend to suffer from the problems of inefficiency, labor-intensiveness, and human error. This paper proposes a fully automated AI-solution for speed violation detection and electronic issuance of e-challans that integrates vehicle detection through YOLOv8, tracking through DeepSORT, and license plate recognition through EasyOCR. These identify overspeed vehicles with their license details and issue fines almost instantly with rather limited human intervention. With numerous tests under varied conditions, the proposed solution has displayed accuracy in detection, tracking, and OCR beyond earlier models such as YOLOv5 and OpenALPR. Future work may include features like real-time cloud processing, license plate recognition in multiple languages, and capabilities for better performance in low-light and inclement weather conditions, thus augmenting large-scale smart traffic solutions in cities.

Keywords: Speed Violation, YOLOv8, DeepSORT, Easy OCR, E-Challan, Real-Time Detection, AI Surveillance.

Predicting Early-Onset Alzheimer's Disease with Ensemble Machine Learning Models and Biomarkers

Engr. Sanea Bhutto[1] - Dr. Sobhya Karamullah Soomro[2] - Dr. Sanobar Baloch[3] - Ahmed Muhammad Shaikh[4] - Saeed Ahmed Talpur[5]

1. Department of Computer Science, Sindh Madressatul Islam University, Karachi
2. Liaquat University of Health and Medical Sciences, Jamshoro
3. Indus Medical College and The University of Modern Science, TMK, Sindh
4. Cleveland State University, Ohio, USA
5. Information Technology Centre, Sindh Agriculture University, Tandojam

Abstract: While early detection of the disease can help a lot in its better treatment and management, early detection of Alzheimer's disease remains one of the biggest challenges. This research investigates the performance of ensemble machine learning models using biomarker data for the prediction of Alzheimer's in subjects aged over 60 years. The study integrates the power of Random Forest, Gradient Boost, AdaBoost, and XGBoost ensembles for improved prediction accuracy with reliability. It involves data processing, normalization, followed by feature selection using the importance scores given by Random Forest. Further, using only top-ranked features, the models are trained and evaluated by using accuracy, precision, recall, F1-score, and ROC-AUC metrics. Gradient Boost outperformed others at 0.9581, followed by XGBoost at 0.9465 and Random Forest at 0.9326, while AdaBoost performed moderately with an accuracy of 0.9116. These findings are the harbinger of the machine learning models' promise in detecting early onset using biomarker information, with advanced prospects for clinical approaches and preventive measures in Alzheimer's disease.

Keywords: Early diagnoses; Alzheimer Disease; Biomarker, Ensemble methods, machine learning.

Power Optimized Smart Lighting System Using STM32 Nucleo-64 Board

Muhammad Sadiq[1] - Muhammad Aslam[1] - Bibi Mahmouna[1] - Sibghat Ullah Bazai[1] - Mehrullah Soomro[1] - Hamza Anwar[2]

1. Department of Computer Engineering, Baluchistan University of IT, Engg. & Management Sciences, Quetta
2. Control, Automotive and Robotics Lab, National Centre of Robotics and Automation, Rawalpindi

Abstract: In today's modern realm, the development of electronic consumer devices, especially in the field of microcontrollers, plays a pivotal role. While many technological efforts are attempting to solve this problem, this research paper distinguishes itself by focusing on the implementation of smart lighting systems on a spectrum of microcontrollers, including the Arduino UNO, Arduino MEGA, STM32 Mainstream, and STM32 ultra-low power boards. Its main point is the development of quality algorithms to reduce power consumption and control light intensity. Through meticulous and carefully comparing performance metrics including power consumption metrics, response times, and operational costs, this study is on the efficient hosting of various microcontroller configurations, that implement intelligent lighting systems. By diving deep into the complexities of power optimization and lighting management, this research advances our understanding of sustainable technological solutions that have multiple potentials to correct societal electricity burdens.

Keywords: Smart Lighting System, Power Optimization, STM32, Smart Embedded System.

Privacy-Preserving Network Security Optimization: An Efficient CKKS-Based Framework for Modern Communication Systems

Abida Naz[1] - Reshma Siyal[2] - Abdul Sattar Mashori[3]

1. School of Computer Science and Engineering Central South University Changsha, China
2. School of Computer Science, Central South University, Hunan, China
3. College of Agricultural Engineering, Shanxi Agricultural University, Taigu, China

Abstract: Modern communication systems, including advanced 5G/6G networks, expansive Internet of Things (IoT) ecosystems, and cloud computing infrastructures, are increasingly exposed to sophisticated cyber threats due to their distributed and heterogeneous nature. As these systems process sensitive data across diverse environments, achieving robust security while maintaining high-speed data processing capabilities has become a critical challenge. Traditional security mechanisms often fail to provide the necessary balance between strong cryptographic protection and efficient data handling, especially in resource-constrained and latency-sensitive applications. This paper proposes a novel, optimized framework for secure and efficient data transmission by employing Fully Homomorphic Encryption (FHE) utilizing the CKKS (Cheon-Kim-Kim-Song) scheme, which enables privacy- preserving computations on encrypted data without decryption. To enhance computational efficiency, we introduce an innovative optimization technique involving adaptive parameter tuning and parallelized execution, significantly reducing computational overhead while preserving robust security guarantees. Our approach seamlessly integrates CKKS-based encrypted data processing with dynamic optimization mechanisms to enhance throughput and reduce latency, ensuring practical deployment in real-world network environments. Evaluation on UNSW- NB15 achieved 98.2% accuracy, 98.7% precision, and 97.5% recall for intrusion detection, while CIC-IDS2017 yielded 97.8% accuracy, 97.1% precision, and 96.4% recall in threat detection, all while maintaining efficient encrypted data processing. Furthermore, the solution provides a scalable, privacy-preserving mechanism suitable for secure IoT networks, achieving an optimal balance between cryptographic security and communication performance. This approach offers promising potential for enhancing the resilience of next-generation communication systems against emerging threats.
Keywords: Fully Homomorphic Encryption (FHE), Security, Data Privacy, Threat Detection, Cybersecurity

Sentiment Analysis of Brahui Texts Using TF-IDF and Logistic Regression

Yasir Ahmmed[1] - Naseer Ahmed[2] - Zahid Latif[3] - Abdullah[3] - Farzana Mehr[3]

1. Department of Computer Science & Information Technology BUETK, Balochistan
2. Department of Computer Science, Sindh Madressatul Islam University, Karachi
3. Department of Computer Systems Engineering & Sciences BUETK, Balochistan

Abstract: Our research work focuses on finding feelings (positive, negative, or neutral) in Brahui language texts. Brahui is a low resource language, and there is not much data or research available for it. In this project, we collected a dataset of Brahui words from different Brahui academies, and their related sentiments. We used basic machine learning techniques to build our model. First, we changed the text into numbers using a method called TF-IDF (Term Frequency-Inverse Document Frequency) Then, we used Logistic Regression, a simple and powerful algorithm, to train the model. After training, we tested the model using unseen data. The results showed that our model can correctly find the sentiment of Brahui words with good accuracy. This research is important because it helps in creating language tools for Brahui. It can also be used in future for social media monitoring, customer feedback systems, and more. Our work is one of the first steps toward using machine learning for understanding the Brahui language.

Keywords: Brahui Language, Sentiment Analysis, TF-IDF, Logistic Regression, Machine Learning.

The Impact of Climate Change on Elderly Persons Using Artificial Intelligence

Amjad Ali Khawaja

PhD Scholar, Department of Computer Science, SMI University, Karachi

Abstract: Nowadays, the impact of climate change affects all areas of life, from children, adults and elderly persons. The effect of climate change is highly significant on elderly persons due to age-related vulnerabilities and limited adaptive capacity. This research highlights the impact of climate change on elderly persons through a survey-based approach supported by the Artificial Intelligence (AI) technique. The object of this study is to identify climate-related health problems and risks, behavioral adaptations based on events, and access to valuable resources among individuals aged 60 and above. A structured closed questionnaire was circulated through urban and rural areas, collecting feedback on exposure to extreme climate conditions, health-related outcomes, condition of houses, and access to basic healthcare facilities. The responses collected from different areas were twelve hundred, and analyzed with the help of machine learning algorithms such as K-Means Clustering and Decision Trees to identify, detect patterns, and classify risk levels. AI systems efficiently identified regional gaps and identify relationship between socio-economic conditions and health outcomes. The survey results highlight that over 65% of respondents reported at least one or more climate-related health problems in the last five years, with dementia, heat stress, and respiratory illness as the most common problems being highlighted. This study demonstrates the value of AI in enhancing survey analysis and generating meaningful insights. The findings support healthcare providers and community organizers in designing targeted interventions, awareness, and educational campaigns to protect elderly persons from the increasing health risks posed by climate change to save their lives.

Keywords: Climate Change, Elderly persons, Artificial Intelligence, Survey-Based Approach.

Resolving Karachi's Traffic Issues Through Embedded Systems

Anil Baloch

Department of Computer Science, Sindh Madressatul Islam University, Karachi

Abstract: Karachi, Pakistan's largest metropolitan city, faces severe traffic congestion due to a rapid increase in vehicles, poor traffic management, and inadequate infrastructure. The consequences include extended commute times, increased fuel consumption, elevated pollution levels, and rising road accident rates. Traditional traffic management strategies have proven insufficient in addressing these evolving challenges. This research explores the potential of embedded systems as a modern and efficient solution to improve traffic flow, reduce congestion, and enhance road safety. By leveraging real-time monitoring, adaptive traffic control, and automated enforcement mechanisms, embedded systems can bring about transformative improvements in traffic management. The proposed model integrates smart traffic signals, intelligent vehicle detection, and IoT-based communication for centralized monitoring and decision-making. Additionally, the system aims to support emergency vehicle prioritization and public transportation efficiency. The goal is to present a comprehensive, scalable, and sustainable approach to revolutionizing Karachi's urban mobility framework through the strategic application of embedded technology.

Keywords: Karachi traffic, Embedded Systems, Smart Traffic Management, and Urban Mobility Solutions.

Towards The Development of an AI Fuzzy Inferencing System for Academia and Industry Linkages in Pakistan

Nooruddin

Abstract: The rapid pace of technological development has led to an increasing demand for collaboration between academia and industry. Sharing knowledge and expertise between these two sectors can help accelerate innovation and promote economic growth. Nowadays, academia and industry linkage are considered a key factor in any country or region's innovation and economic development because it simplifies industries' use of new scientific information for commercial purposes. During this research, a sophisticated fuzzy expert system has been developed to provide a decision support platform based on the factors affecting Pakistan's academia and industry linkage. We selected the Pakistan region as a case study to gain better insight into the design. A fuzzy logic Inferencing system has been selected as it has been found to work well in cases of uncertainty. A Mamdani-based fuzzy Inference system has been developed with the help of a literature review and structured interviews. As complexities of data positions of membership functions were Unknown, we compared five (5) different types of defuzzification methods over three selected variables: Lack of Coordination, people in academia and industry aren't working well together. Lack of Financial Support problem: There isn't enough money to support collaboration between academia and industry. Lack of Government Policies Problem: The government hasn't established effective rules to encourage cooperation between academia and industry. Five defuzzification methods were compared: centroid, bisector, Smallest of Maximum, Large of Maximum, and Medium of Maximum. The results indicated that the Medium of Maximum (MOM) method could provide a scalable output that better reflected the ambiguities of the related variables, their membership functions, and associated rules. The research findings can be used to develop frameworks and policies to help enhance the linkage of academia and industry, specifically in the Pakistan region.

Keywords: Artificial Intelligence, Academia and Industry Linkage, Fuzzy Logic, Fuzzy Defuzzification Methods.

4th ICCRT 2025
International Conference on Computing and Related Technologies
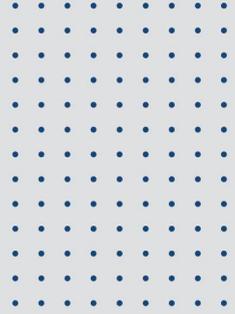
Alma-Mater of Quaid-e-Azam Mohammad Ali Jinnah
Sindh Madressatul Islam University, Karachi
Aiwan-e-Tijarat Road, Karachi-74000
Phones: (021) 99217501-03 Fax: (021) 99217504
Email: info@smiu.edu.pk, URL: www.smiu.edu.pk